KEYENCE

NEW **Easy Setup, Auto-Teaching Machine Vision System**

CV-X100 Series

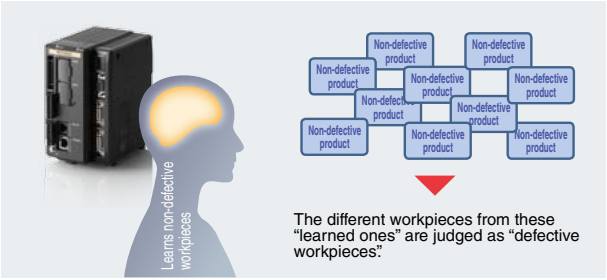
Human-level judgement readily available for anybody

CV-X100 Ver.2

A new function that allows anyone to quickly and easily achieve everything from setup to confirmation of inspection standards.

01 Auto-Teach Inspection

Human-like sense of judgement

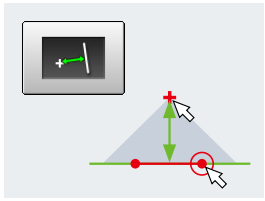

Learns non-defective workpieces
Non-defective product
The different workpieces from these "learned ones" are judged as "defective workpieces."

The image sensor auto-teaches variations such as product colour and individual differences that exist in the non-defective workpieces. "Auto-Teach Inspection" is a thinking tool which recognises the similarity with the non-defective workpieces instead of detecting the defective one. This feature eliminates the conventional unstable factors.

P.4

02 Dimensions/ Geometry Tool

The high-precision measurement requires nothing more than clicks

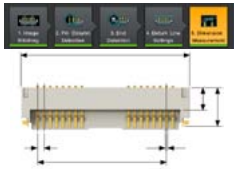


Measurement is completed just by clicking the point to measure. Complex calculation elements that were conventionally needed for dimensional geometric measurement have been completely eliminated.

P.6

03 Connector Tools

Complex connector inspection setting is completed just by following steps



Setting is completed just by following steps. KEYENCE original appearance inspection tools can also be used at the same time.

P.7

07 Utilities

Professional knowledge adjustments incorporated into utilities

"Tool Adjustment Navigation" is for false positive correction, and "Camera Installation Replication" for the horizontal deployment of the line. Those make the professional adjustment know-how into utilities.

P.14

08 Tool Catalogue

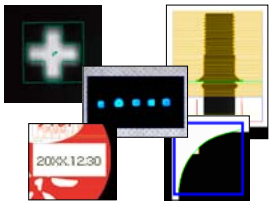
Your desired selection of inspection tools achieved through the catalogue

Tool Catalogue enables intuitive tool selection from applications such as "Presence/ Discrimination inspection" and "Stain/ Flaw inspection".

P.17

04 Measurement Algorithm

The evolving algorithm delivers reliable inspection

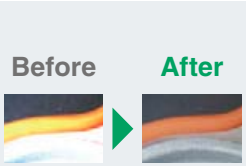


The latest algorithm groups that have continued to evolve based on long field-proven experience, strongly support stable inspection.

P.8

05 Image Optimisation

Ideal imaging according to inspection targets and equipment



Various tools are provided to dramatically optimise inspection images according to inspection targets, installation environments, and equipment motions.

P.10

06 User Interface

Optimal operation screen selection possible through pre-defined options

Optimal screen configuration is completed just by selecting from the catalogue on the screen and a specialised operator menu setting is completed just by selecting the setting parameters.

P.12

NEW Easy Setup, Auto-Teaching Machine Vision System
CV-X100 Series

09 Security

Robust security preserves your assets

Passwords of up to 32 digits can be set. Place restrictions on editing and browsing settings to prevent leakage of user know-how embedded in the programme.

P.18

10 User Manual Auto-Generation

A single button click to create customised user manual based on applied settings

It is possible to create a dedicated manual according to the settings with a single button. This feature supports the operation after introduction, the most important for the image processing.

P.19

11 Communication and Control

A wide variety of communication methods compatible with existing systems

Supports linking to PLCs made by several manufacturers as well as EtherNet/IP and PROFINET.

P.20

01 Auto-Teach Inspection Tool NEW Colour

An inspection tool that “auto-teaches”; Just running non-defective workpieces completes the application setup

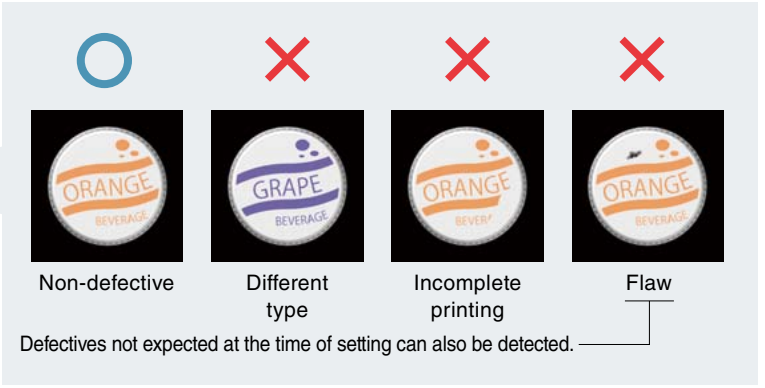
The newly incorporated “Auto-Teach inspection tool” that uses the image sensor to learn variations and individual differences that exist in the non-defective workpieces and recognises workpieces that differ from these as defective workpieces. These algorithms, which are unlimitedly close to the human sensation, eliminate unstable elements to successfully guide on-site inspection. Settings are performed just by running non-defective workpieces, and resolves the conventional need for high expertise and the complication of settings. This is an inspection tool that makes it possible for anyone to achieve and maintain the stable inspection.

Just run non-defective workpieces

Setting completed!

New invention!

“Those different from learnt non-defectives” are detected as “defectives”.



Ideal for the following applications:

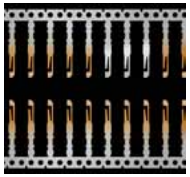
1 Setting is often required due to multiple product types

Misarrangement inspection for boxes of tissues

Even with many product types, setting is completed just by running non-defective workpieces. A wide variety of product type elements, including colour, shape, and pattern can be handled with a single tool.

2 There are many points to inspect

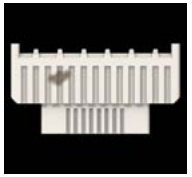
Plating defect inspection for lead frames



Complex setting with many points to inspect can be covered by the “Auto-Teach Inspection Tool” alone. No colour setting is required either.

3 Complex shaped positions to inspect

Flaw inspection for connector housings



Since this tool learns the entire workpiece including the profile, you do not have to set multiple regions according to complex shapes of workpieces.

4 Variable non-defectives

Assembly defect inspection for instrument panel buttons

It is possible to prevent non-defective workpieces from being rejected mistakenly because this tool learns and inspects variations such as different thicknesses caused by different lighting conditions, which can occur for non-defective workpieces.

Easy 3 steps auto-teaches the full colour information by pixel!

A confusion-free step method is adopted for setting. In addition to basic 3-step setting, a verification step is also available.

1 Locate Part

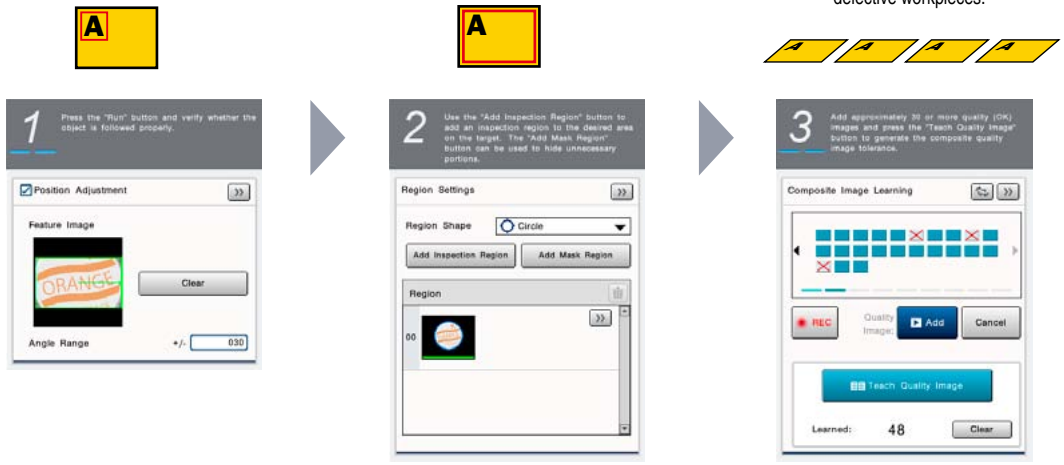
Just surround the featured region.

2 Inspection Region

Just surround the region to be inspected.

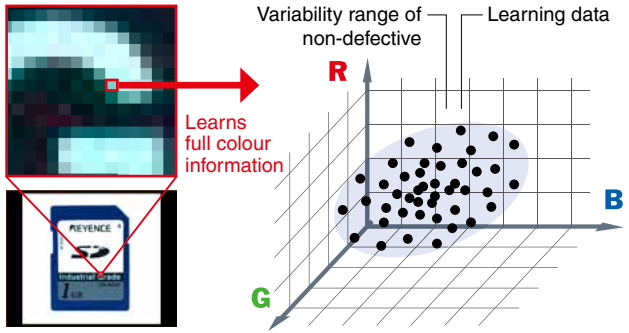
3 Auto Teaching

Just run non-defective workpieces.



Learning Full Colour information

The variability range of the non-defective workpieces is determined by learning all full colour information by pixel. The exact auto-teach is performed even in the non-defective colour shading which is not judged by the black & white.



Helpful in realising easy operation

Cut Incorrect Learning function

Defective workpieces are automatically eliminated even if they are mixed-in during auto-teach. It is possible to preclude the human errors by the image sensor.

Set Auto Threshold function

Automatically calculates and sets threshold values from the learned non-defective workpieces.

"Auto-Teach Inspection Adjustment Navigation" ensures learnt information to be updated

This utility enables anyone to perform "additional learning" to widen the variable range allowed for non-defective workpieces.
Unnecessary additional learning is prevented by comparing images with defective samples during additional learning.

Defective NG Image
Good OK Image
Skip Image
Images are checked to judge NG archived images
Additionally learns images judged as non-defectives
Compares them with pre-registered defective samples
Unnecessary additional learning prevented!

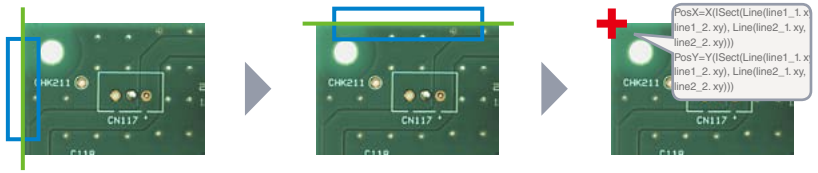
It is possible to restore the conditions before additional learning if a defective sample has been judged as OK.

02 Dimensions/Geometry Tool NEW

High-precision measurement can be done intuitively through simple mouse operations

In most cases, dimension/geometric measurement requires multiple tools and complicated calculation processing. With the CV-X100 Series, dimension/geometric tools that resolve this complicated processing with a clicking alone has been prepared. Because point and straight line information from other tools can also be referenced, it is possible to construct programme settings that are simpler and easier to operate.

Conventional — Combination of multiple settings and calculation is required

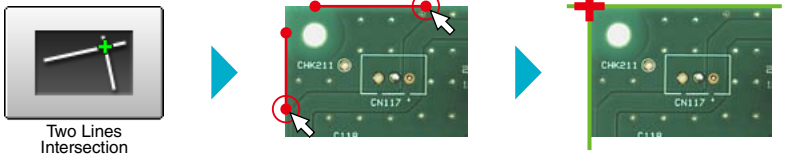

PosX=X(ISect(Line(line1_1.xy, line1_2.xy), Line(line2_1.xy, line2_2.xy)))
PosY=Y(ISect(Line(line1_1.xy, line1_2.xy), Line(line2_1.xy, line2_2.xy)))

Create settings that will detect a line in the left area

Create settings that will detect a line in the top area

Calculate intersecting coordinates between 2 lines with the calculation function

Dimensions/geometry tool — Specify just with the mouse

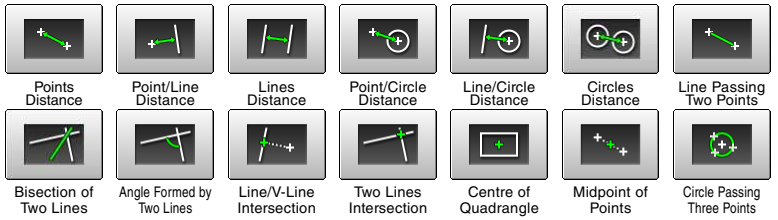


Select the feature to be executed, and

Just specify target lines with the mouse

Easy detection!
It is also possible to reference coordinates, circles, or lines from other tools that have already had their settings completed!

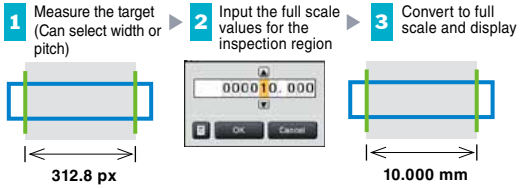
A rich variety of geometry tools that allow you to "just choose"



Easy scaling with any image size

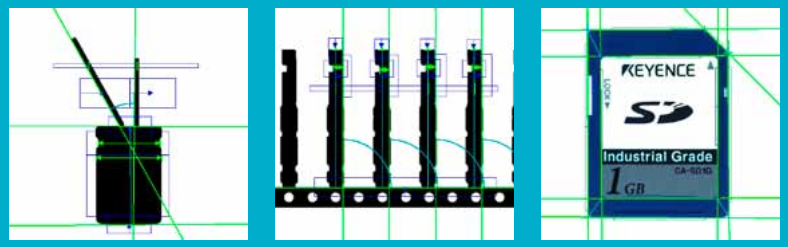
Scaling

Even for applications where you would like to perform operation with full scale values instead of pixels, it is possible to easily convert to full scale with specialised scaling settings.


1 Measure the target (Can select width or pitch)
2 Input the full scale values for the inspection region
3 Convert to full scale and display
00010.000
OK
Cancel
312.8 px
10.000 mm

APPLICATION

Even complex shaped objects such as below can be measured quite easily.



Capacitor

Press parts

Label

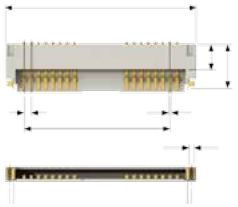
03 Connector Tools

Complex connector inspection setting can be completed just by following steps

Conventionally, inspection setting for connectors with various items and points to be measured requires a significant amount of man-hours. With CV-X100 connector tools, this can be done by anyone simply by following steps.

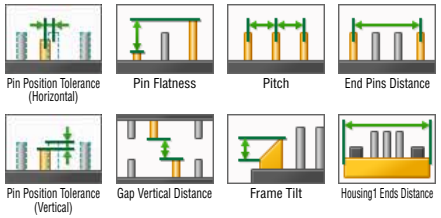
Our step method enables ANYBODY to carry out connector inspection EASILY

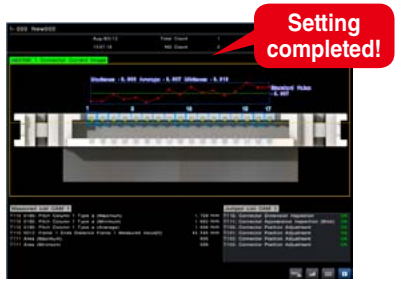
Connector inspection that requires various items to be inspected for each product type and shape



Can be completed just by following steps specific to connector inspection

All you have to do for dimension measurement is to select from various pre-defined connector inspection tools



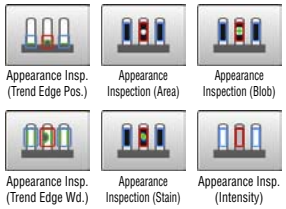


Inspection tools that fully support appearance inspection

Existing tools can be incorporated into appearance inspection for resin overlaps, short-circuits, and flaws on housings. Connector inspection is fully supported with KEYENCE's accumulated appearance inspection expertise for image processing.

Connector Appearance Inspection

"Stain", "Blob", "Area", "Intensity", "Trend edge position" and "Trend edge width" tools are "multi-region" compatible, which enables simultaneous deployment in multiple areas. This significantly reduces setting and adjustment man-hours required for connector-specific multi-point inspection.



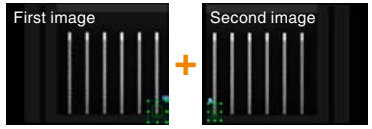
Setting just one point enables automatic deployment in the remaining areas!

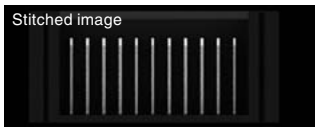
Connector adjustment menu

Purpose-specific, guided navigation is available, including "Change Component" and "Change Pin Number". This allows anyone to make necessary modification.

Image stitching function

Multiple split-captured images can easily be stitched into one image.





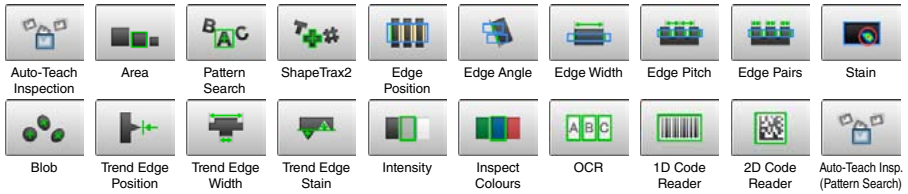
Just specify a pin or stitching point

Connector dedicated operation screen

The operation screen most suitable for the connector inspection can be created just by selecting from the catalogue.

04 Measurement Algorithm

A variety of standard measurement algorithms are available.

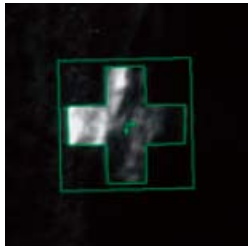


The evolving algorithm supports stable measurement

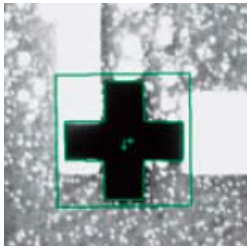
ShapeTrax2™ — An advanced search tool that combines high robustness, high speed, and high precision

High robustness that performs accurate searches even under poor conditions

Registered image


Defect

Unclear profile


Inverted tones

Ultra high-speed processing

ShapeTrax2 achieves the significant high-speed performance by the fundamental review of the processing algorithms. It gains maximum 10 times faster than conventional speed. In addition, the processing time increases only by a little even for a large capacity image such as 5 megapixel, and the high-speed processing can be made.

Ultra high precision

At 0.025 pixels, a search accuracy that is equivalent to the best in the industry is achieved along with linearity and repeatability. Demands to improve search precision through target miniaturisation and changes to high-accuracy are supported.

Stain — A de-facto standard for appearance inspection tool

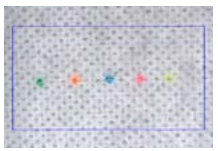
A stain tool is incorporated to realise the appearance inspection without eliminating the non-defective workpieces. A variety of parameters such as size, density, shape, and count are used to accurately find the flaw that you wish to detect.

Flaw detection for resin cap

A small flaw is found in the side of the resin cap.

The stain inspection tool is available for the stable detection of the flaw only and ignoring the influence of the R surface of the side.

Flaw detection for non-woven fabric cloth (fine colour)

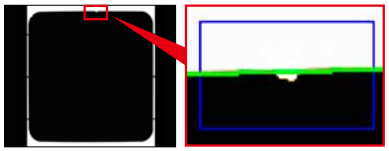


The full colour information captured by the colour camera is directly processed. Regardless of any colour variation against the background, detection can be made.

Trend edge stain — Optimised for flawed object

Detects the flaw on the profile of the product. The profile is automatically extracted just by setting the inspection region to surround it. In addition to geometric shapes such as circles and straight lines, the oval or the profile with complex shape consisting of the free curve is supported.

The flaw that occurred on the corner is detected. Even if the product profile is changed, the reference model follows it to catch only the changed segment.


The flaw occurred that on the line is detected. Only the change of flaw is caught against the reference line.

OCR

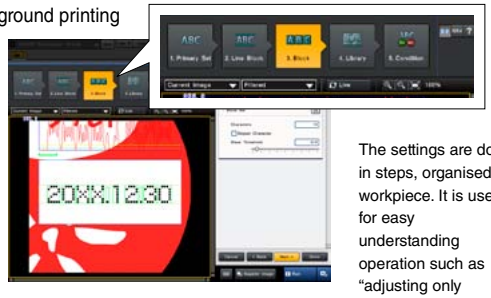
Strong against variations in the on-site capture environment!

The OCR function is incorporated, which enables recognition of the strings only with the character registration and region setting. Not only alphanumeric but also user text (symbols, etc.) can be registered. The marking of dates that change on a daily basis are also supported with the auto calendar function.

Capable of recognition without being influenced by the background printing

Combining use with the Image Extraction filter or the colour to greyscale processing is available for the extraction of the prints solely. Therefore, the recognise strings stabilises.

Easy settings with the step method



The settings are done in steps, organised by workpiece. It is useful for easy understanding operation such as "adjusting only judgement conditions".

1D/2D code readers

Executes reading and inspection simultaneously NEW

Reads the 1D/2D code printed on the target workpiece. This function leads to space saving and cost reduction compared with a conventional case where 1D/2D code readers and camera are installed separately.

"Verification" function supported for 2D codes

DataMatrix

QR code

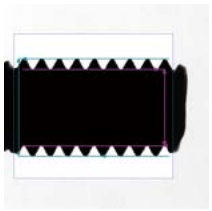
Appearance inspection is performed simultaneously with reading of the 2D code printed on a product.

Trend edge position/width

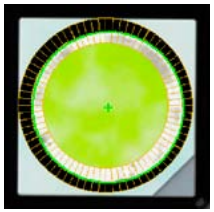
High precision multi-point detection

Just by describing a single region, multi-point edges are detected and in addition to measuring all data for this information, measurement is performed without complicated calculations such as max./min., average width, tip position, and peak-to-peak width. It is also possible to find virtual circle or approximate line from multiple points that have been detected.

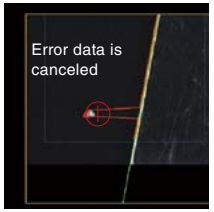
Peak-to-peak width



Virtual circle



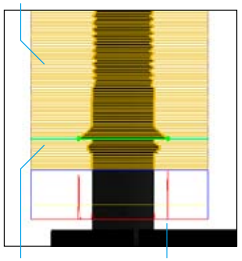
Line



Measuring bolt

Capable of measuring the maximum diameter of the bolt or the screw thread.

The edge detection is displayed for each segment. The result is output individually.



The maximum diameter is detected.

Capable of checking the edge graph for each segment. The reliable setting can be made.

Graphic display

Visualisation of necessary information NEW

Draws figures such as points, lines, circles, and scales on the screen. Since it is also possible to reference values measured by tools, various advantages are offered such as an improved visibility of a detected location on the screen.

Graphic display

Scale display

Displays a scale on the screen. Values can be displayed after conversion to full scale because of a scale reflecting scaling correction.

05 Image Optimisation

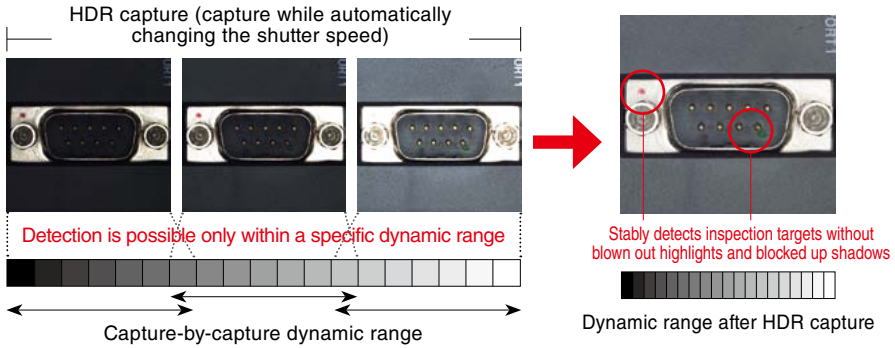
Ideal imaging to ensure stable inspection

"Imaging (capture)" is an extremely important process in image processing. The CV-X100 Series is equipped with many functions to optimise inspection images by resolving problems that may be caused by "target workpiece conditions", "installation environments", and "equipment motions" in this process.

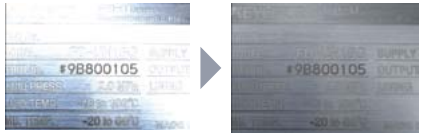
HDR

High dynamic range capture that images inspection targets as they are NEW

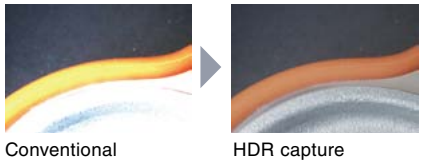
Captures multiple images while automatically changing the shutter speed and composes them at high speed to generate images without blown out highlights and blocked up shadows. Clear images ideal for processing can be captured even when on-site capture conditions vary or inspection targets contain uneven glossiness or mixed intensities.


HDR capture (capture while automatically changing the shutter speed)
Detection is possible only within a specific dynamic range
Capture-by-capture dynamic range
Stably detects inspection targets without blown out highlights and blocked up shadows
Dynamic range after HDR capture

Glare removal



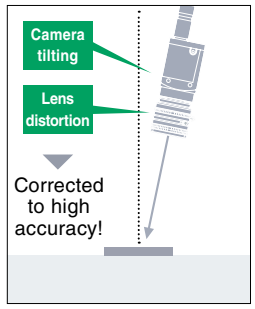
Lighting variation removal



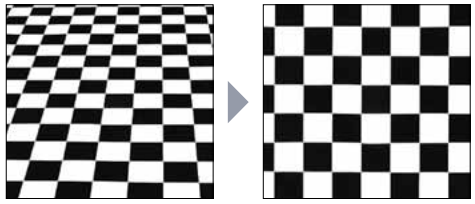
Calibration

Removes effects of lens distortion or camera tilting NEW

Removes effects of changes in the capture conditions due to installation- and hardware-related factors such as "camera tilting" and "lens distortion". This function offers consistent capture conditions, including replicating the same capture conditions for line deployment and eliminating effects of restrictions in the installation environment.



Corrects "tilting"



Corrects camera tilting that may occur during installation. This is also effective when a camera is installed at a tilt angle due to an installation space-related reason.

Corrects "lens distortion"

Addresses a problem where measurement results differ between image centre and edge due to lens distortion.

Multi-capture, random trigger, and pre-capture

Ideal capture configurations can be selected according to inspection

Multi-Capture NEW

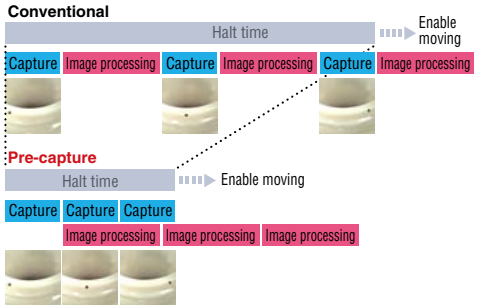
Multiple images are captured in one measurement cycle.
A workpiece is captured while lighting is switched and image processing and result output can be done all together.

Coaxial light clearly shows direction marks on corners.

Low angle light clearly shows print and lead.

Pre-Capture

Image capture is performed at top speed simultaneously storing the image inside the device and concurrently executing image processing.
No restriction will be imposed on the halt time or moving speed regarding the object, and the designed maximum performance can be exerted.



Random trigger

Random trigger is supported, and makes it possible to enter triggers without synchronisation with the process currently being executed.
There is no reliance on current image processing conditions and it is possible to perform image capture that matches equipment movement.

Conventional

The index stopping time had to be extended to align timing or 2 controller units had to be used.

CV-X

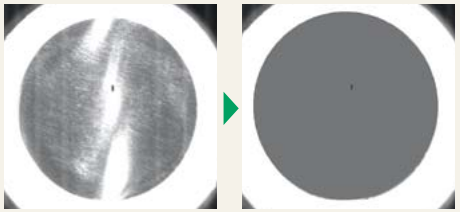
Because there is no latency for image processing, operation without stopping the equipment is possible even with a single controller.

Thorough elimination of factors causing the unstable inspection (image enhance filters)

Shading correction

Improves in real time the factors which prevents the stable inspection such as random shading or uneven brightness on the surface of workpiece.

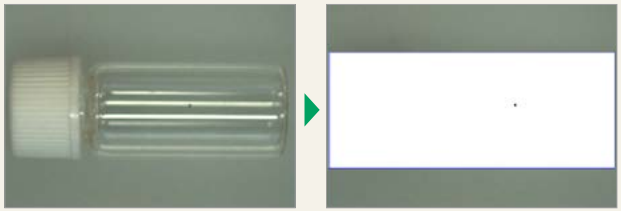
Inspecting stains on the bottom of a can



There are stains among the lustre that occurs at random.

Extracts stains only.

Stain inspection of a clear bottle



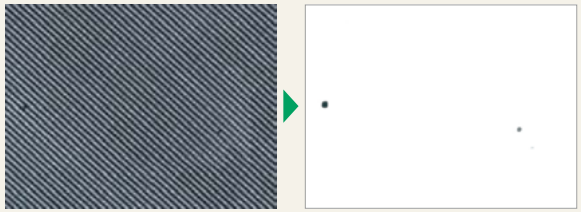
Stain is attached in the randomly-occurred uneven brightness.

Stably detects stains only

Blurring by direction

Has an effect that removes a significant amount of fine background patterns or noise.

Foreign particle detection on a striped pattern



There are foreign particles within the striped pattern that is set in a random direction.

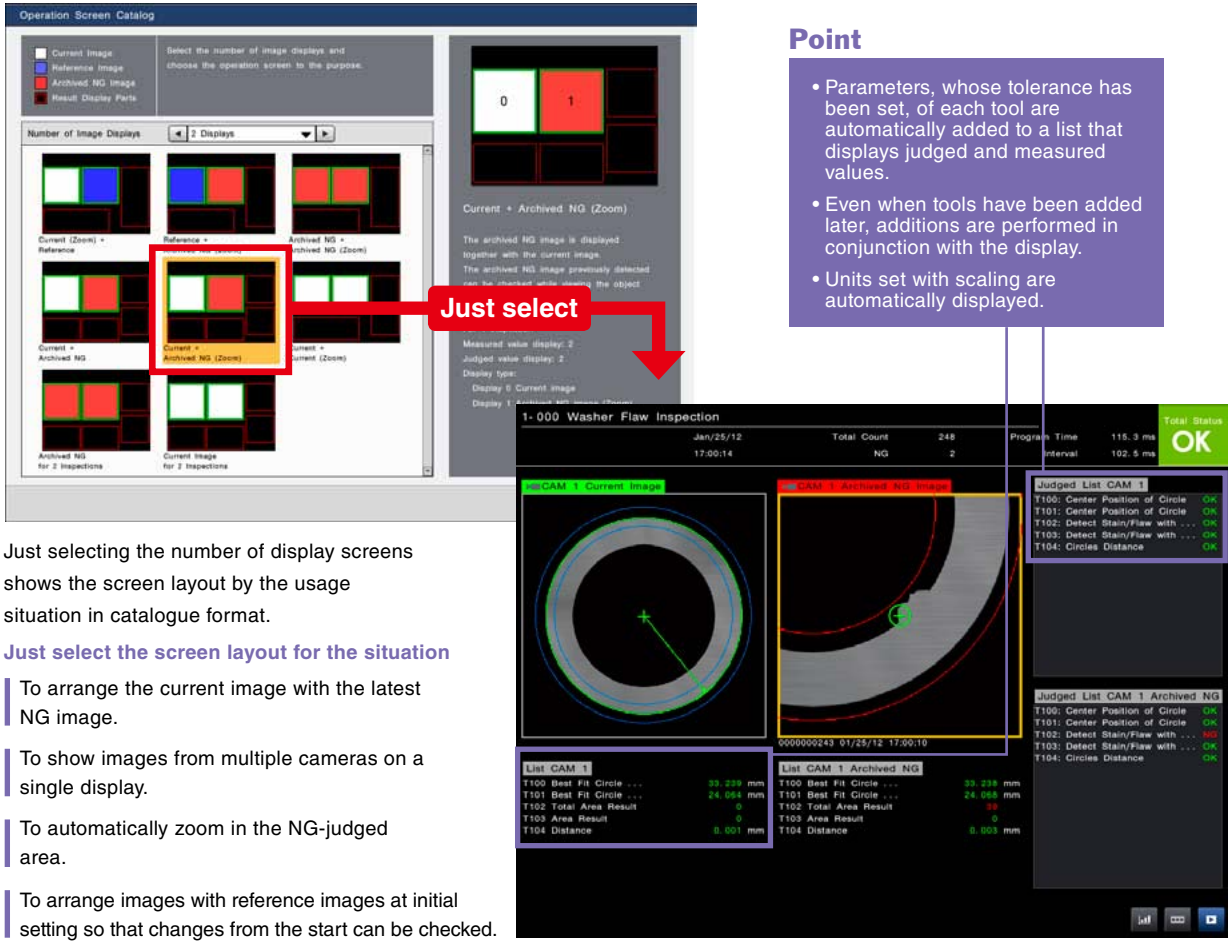
Extracts foreign particles only with a combination of shading correction.

06 User Interface

No complicated customisation is required
Just select, quick start

In order to avoid “easy to use customised screens that cannot be used unless customisation is performed”, an operation screen catalogue function, “just select, quick start”, is incorporated along with a lot of the custom functions.

Just select the best screen from the catalogue. “Operation screen catalogue”



Just selecting the number of display screens shows the screen layout by the usage situation in catalogue format.

Just select the screen layout for the situation

- To arrange the current image with the latest NG image.
- To show images from multiple cameras on a single display.
- To automatically zoom in the NG-judged area.
- To arrange images with reference images at initial setting so that changes from the start can be checked.

Point

- Parameters, whose tolerance has been set, of each tool are automatically added to a list that displays judged and measured values.
- Even when tools have been added later, additions are performed in conjunction with the display.
- Units set with scaling are automatically displayed.

Intuitive operation when creating settings

Tool bars displaying thumbnail previews

Added tools are displayed in thumbnails. Because the inspection region is displayed in a thumbnail, it becomes easy to understand which part should be inspected.

Intuitive operation with a mouse

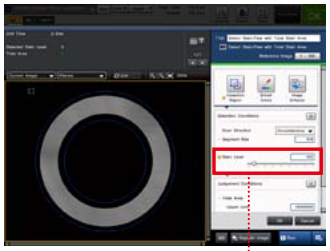
The icon-based, easy-to-understand GUI enables intuitive operation with a mouse. In addition, the region can be operated on the display directly with a mouse at setting.

* Microsoft is a registered trademark of Microsoft Corporation in the United States and other countries.

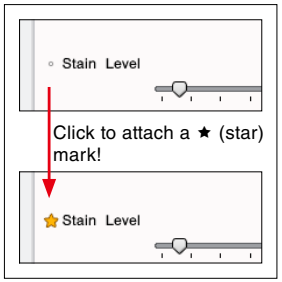
A “custom menu” that realises the optimal operation with a single click

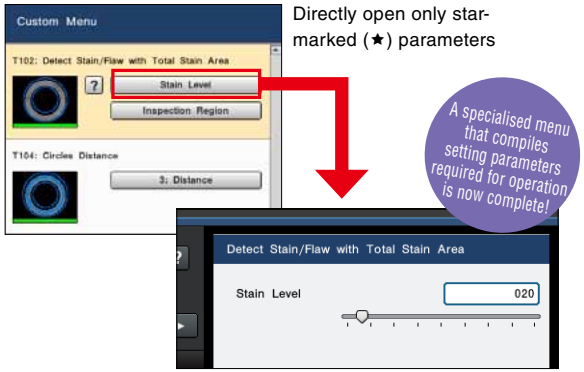
During operation, some parameters are often adjusted, and some are kept behind the operation to prevent misoperation. When using the “custom menu” function, the optimal operator menu can be created just by placing a “★” on parameters that are often adjusted.

Just mark the parameters when performing settings...



When it seems that these parameters are adjusted often...

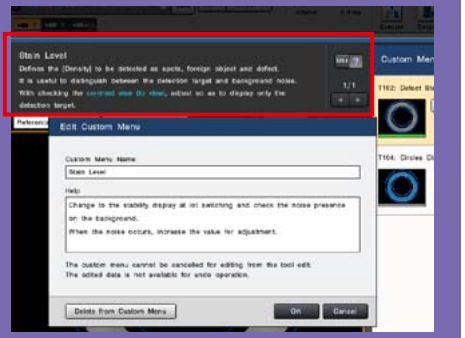




Directly open only star-marked (★) parameters

A specialised menu that compiles setting parameters required for operation is now complete!

Operation comment function included

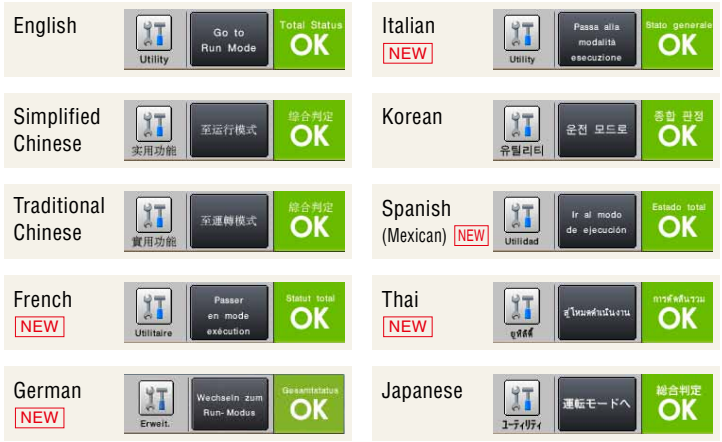


The operation comment in free description can be displayed on the help field. The display of information that is necessary to set the timing, situation, and guidelines is mixed with operation functions.

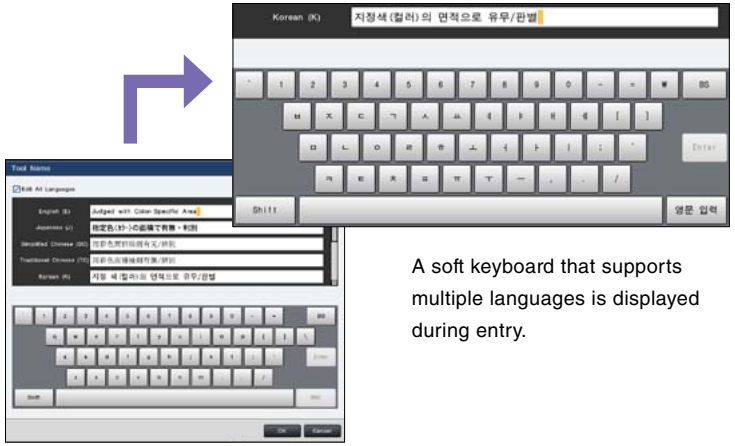
Ten languages supported

Multi-language input system incorporated

In addition to conventional display language switching, the character input function also supports multiple languages. It is possible to perform direct input for each language with things such as the tool names or the custom menu comment function and operation screen display character strings without switching the language for the system itself.



The character string input on controller also supports multiple languages



A soft keyboard that supports multiple languages is displayed during entry.

07 Utilities

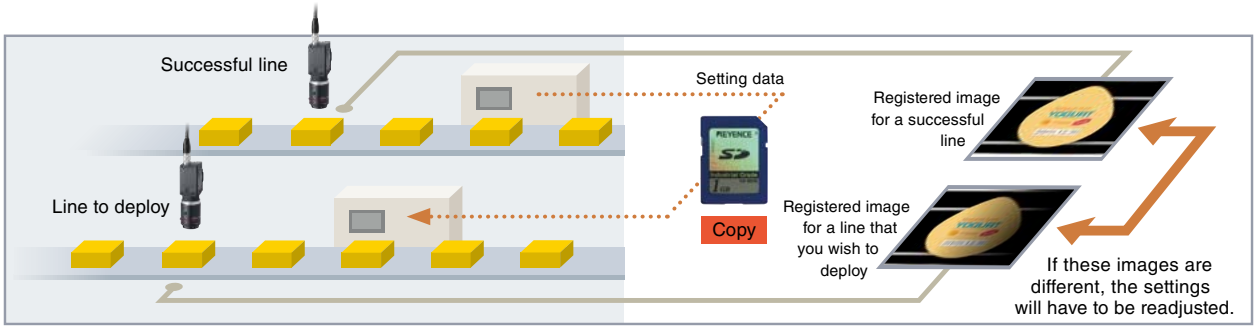
Easy-to-use utilities applying “Professional knowledge” from on-site experiences.

There are many useful utilities for various situations, such as “I want to develop the inspection environment into the neighbour line as well.”, “I’m going to make adjustments due to often-occurring false detection for some reason.”, and “I want to manage the inspection process.”

Navigation that “always guarantees a consistent image capture environment without relying on location”. “Camera Installation Replication” NEW

Conventional

The production line has been extended, so I would like to expand the inspection environment without making changes. The setting data is copiable. If I could have replicated just the same camera installation, I wouldn’t have to readjust or start the settings over.

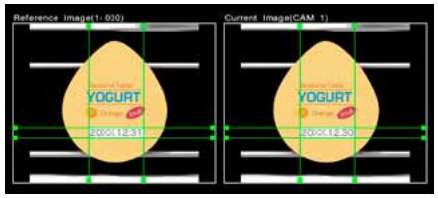

Successful line
Line to deploy
Setting data
Copy
Registered image for a successful line
Registered image for a line that you wish to deploy
If these images are different, the settings will have to be readjusted.

Camera Installation Replication

The camera installations in the neighbouring successful line are replicated

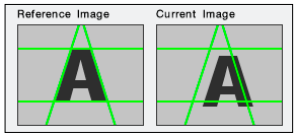
The current image can be matched with the same capture conditions as those of the reference image. This is useful for: 1. Matching an image for a line to deploy with the reference image for a successful line. 2. Making a comparison with the reference image at the point in time when the settings were created to check “if the conditions are always the same.”

Position Adjustment Tool

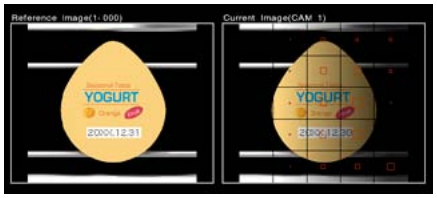


Successful line Line to deploy

Draws grid lines in featured areas of the reference image. The position of the camera is adjusted using the grid lines on the current image side that is moving in tandem as a guideline.

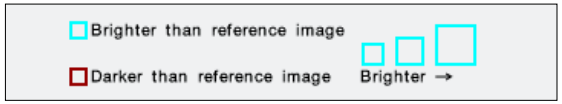


Brightness Adjustment Tool



Successful line Line to deploy

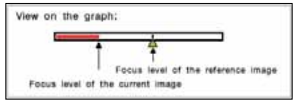
Shows areas with different brightness from the reference image in colour so that you can adjust them to reduce the difference.



Focus Tool

Successful line Line to deploy

A comparison with the focal condition of the reference image is displayed in a bar graph. The focus of the lens is adjusted to match the level of focus for the reference image.



Implement adjustment; for anyone, without questions, with certainty “Tool Adjustment Navigation” NEW

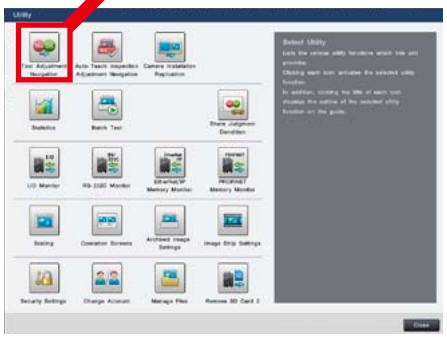
Conventional I have no idea where I should start adjustment

- I can’t figure out which tool I should adjust…
- A position adjustment failure may be the cause of the false judgement...
- I’m at a loss as to which image I should adopt for correcting the tool setting...

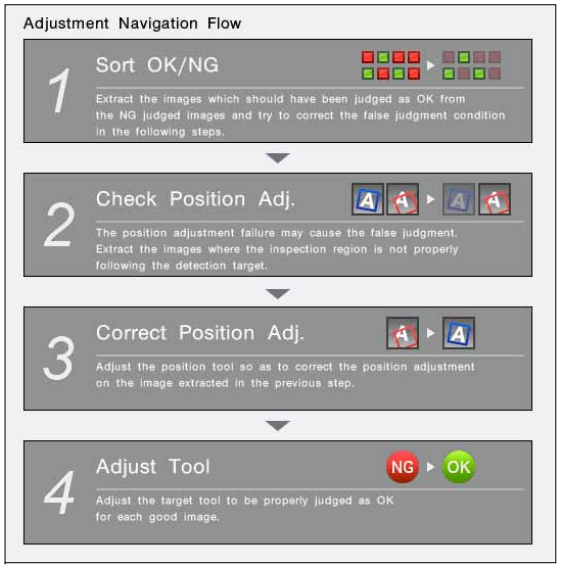
Tool Adjustment Navigation Navigation for accurate and optimal adjustment

When the utility is launched, navigation starts after analysing archived images

Click!

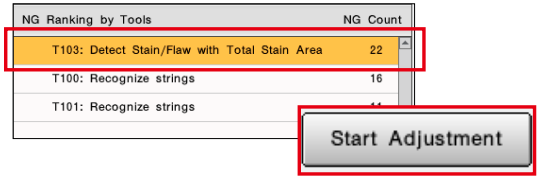


Navigating adjustment procedures when non-defective workpieces have been mis-detected


Adjustment Navigation Flow
1
Sort OK/NG
Extract the images which should have been judged as OK from the NG judged images and try to correct the false judgment condition in the following steps.
2
Check Position Adj.
The position adjustment failure may cause the false judgment. Extract the images where the inspection region is not properly following the detection target.
3
Correct Position Adj.
Adjust the position tool so as to correct the position adjustment on the image extracted in the previous step.
4
Adjust Tool
NG
OK
Adjust the target tool to be properly judged as OK for each good image.

Example of setting procedures

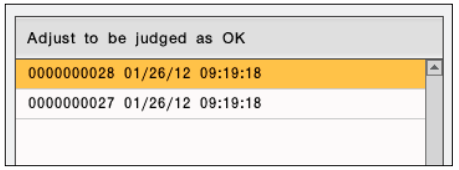
1 Select a tool that has a high NG count from the NG ranking by tools and then start adjustment!



2 Sort out the images that should be judged as OK.

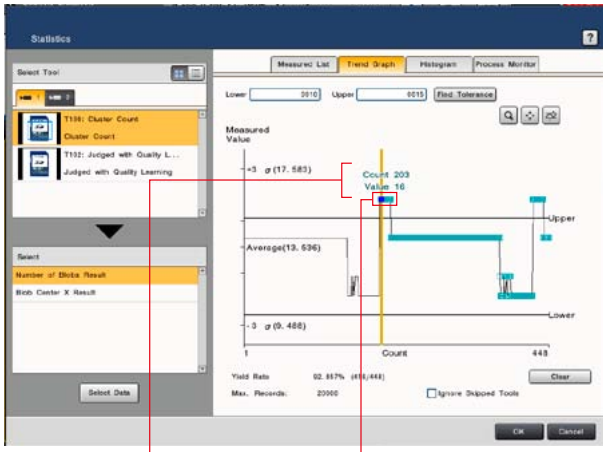
3 When position adjustment is used, the user is automatically prompted to check the reference tool.

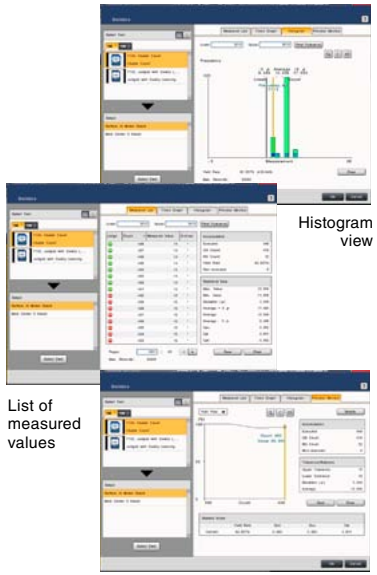
4 Only the images that need to be adjusted with the selected tool are extracted.



To manage the process, not just the recording. “Statistics” NEW

Up to 20,000 pieces of measurement data can be recorded with the controller alone. It is possible to easily check the value such as minimum, maximum, average, standard deviation, NG count, and yield. In addition to the trend graphs, a list of measured values and a histogram can be displayed. Also, by using the newly-included function, Process Monitor (process capability index: Cpk), it is available for analysing the inspection processes more statistically.





Histogram view

List of measured values

Process monitor

Vertical cursor

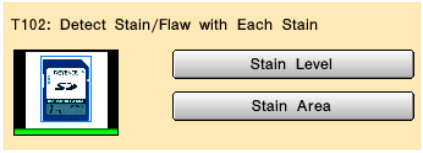
Displays the measured values and the total count for the selected cursor position.

Image save mark

■ marked data has its image data saved. It is possible to check images by clicking.

Tolerance overwrite function

Judgement conditions and stain levels can be rewritten during operation. This enables you to adjust tolerance easily even where the relevant line cannot be stopped.

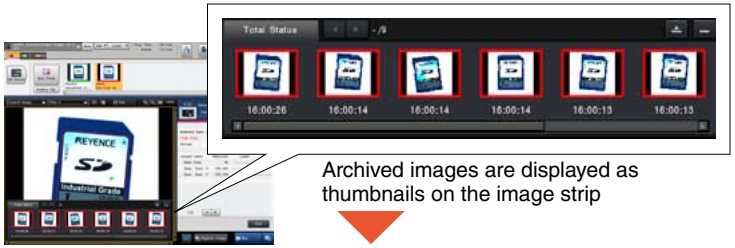


Judgement conditions sharing function

Judgement conditions can be shared between tools. This function is useful when the same inspection processing is required on multiple points on the screen, because a change on one point is reflected to the others.

Archived Image/image output

Every single image can be saved within the main buffer capacity range. It is also possible to output images externally (to SD card, PC programme, or FTP server) while saving to the main buffer.



Archived images are displayed as thumbnails on the image strip

Just click the image on the image strip during setup to automatically execute a retest with that image.

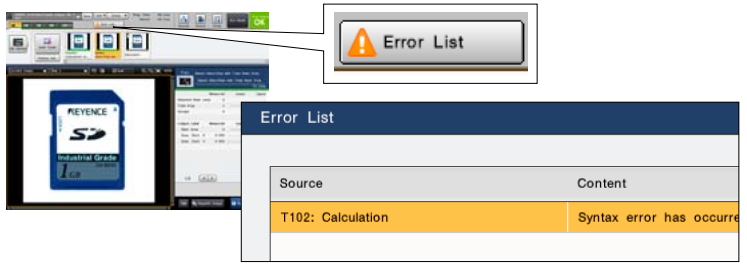
Maximum number of images* that can be saved, organised by connected camera

Camera type	Number of images saved to the internal memory	Number of images saved to the 4 GB SD card
Monochrome 240,000 pixels	1001	16284
Colour 240,000 pixels	992	5490
Monochrome 310,000 pixels	489	13071
Colour 310,000 pixels	484	4396
Monochrome 1 megapixel	233	4056
Colour 1 megapixel	224	1356
Monochrome 2 megapixel	105	2114
Colour 2 megapixel	97	706
Monochrome 5 megapixel	35	816
Colour 5 megapixel	27	272

*These are typical values in regard to saving to the internal memory when a single camera is connected using CV-X170 and when storage conditions for archived images has been “total status NG”. Typical values with a single connected camera when saving to a 4GB SD card.

Error notification

Displays setting errors in a list. It is also possible to select the error from the list screen and jump to the corresponding area.



08 Tool Selection Catalogue based on Application NEW

Just select the desired application, instead of selecting algorithm.

A tool catalogue that intuitively makes it understood which tool is best to use from the contents that you wish to inspect has been adopted. This makes it possible for the users to select the best tools without comprehensively understanding all the included algorithms.

Tool catalogue

The tools have been categorised according to application, based on the longstanding knowledge of the KEYENCE CORPORATION. It allows you to intuitively find the best tool for the inspection.

Application navigator

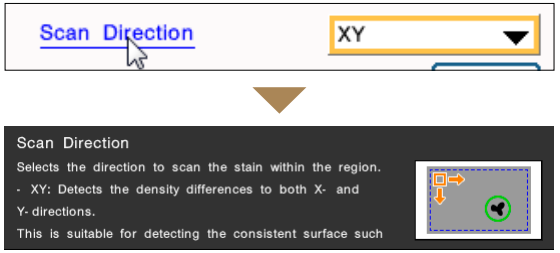
Information for the purpose of making optimal selections such as category explanations and typical applications that use each tool are displayed.

Settings menu organised by application

Specialised and necessary parameters for applications have been arranged on the front screen of the menu. Settings creation that is simpler and easier to understand is possible.

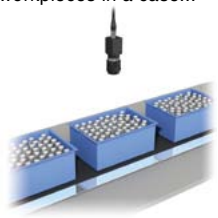
Guide function

A guide function is incorporated and explains the parameter being set. By referencing the guide it is possible to check what kind of changes are occurring with the controller when adjusting the parameter.


Scan Direction
XY
Scan Direction
Selects the direction to scan the stain within the region.
- XY: Detects the density differences to both X- and Y- directions.
This is suitable for detecting the consistent surface such

APPLICATION

When setting to count the expected number of workpieces in a case...



Conventional

Settings cannot be performed because it cannot be reliably determined which algorithm is the best choice...

Tool catalogue

Just select inspection category from the tool catalogue

Summarised into “Count” categories, so there is no confusion.

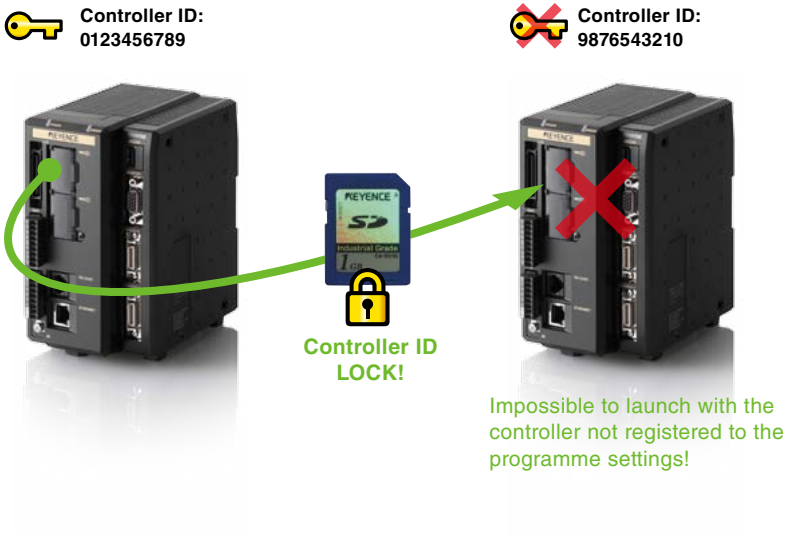
09 Security/Account

Robust security that protects programme assets

For image sensor operation, it is important the setting contents are easy to understand and can be easily accessed. On the other hand, there is an extremely strong need to not disclose programme contents as know-how and prevent the copying of setting files. With the CV-X100 Series, robust security functions that answer these demands have been prepared and separated by purpose.

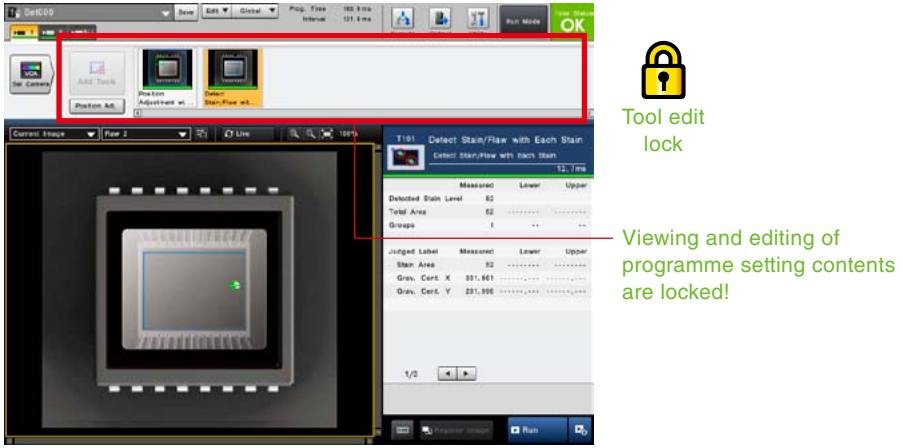
Controller ID lock

This is a function that does not start programme settings with controllers other than those that have the specified, unique ID (controller ID). This is useful in protecting the copy of programme assets including unintended controller operation.



Tool edit lock

If a tool edit lock is applied, browsing or editing programme setting contents will no longer be possible. This prevents the external outflow of setting know-how such as setting parameter values or pre-processing.



Password settings

The entry of up to 32 characters is supported for the password. This feature meets demands for more secure password management.

Account settings

~Operating setting protection~

In order to make a smooth operation after introduction, 3 types of accounts are provided. Using an account that has been managed with a password prevents operation mistake and unnecessary setting changes.

Admin	All operations are possible.
Operator	Custom menu operation, change programmes, and saving are possible.
User	Only viewing operations are possible.

Password settings for the purpose of change accounts are possible.

10 User Manual Auto-Generator/ PC Software

The “user manual auto-generator”, which creates a manual for previously created setting file contents, the “PC simulation function” that reproduces controller operation on a PC, and PC software with the “data logging function”, which collects NG images and measurement data, have been included as standard.

PC software that strongly supports operation

Optimal operation is from a customised manual. “User Manual Auto-Generator” NEW

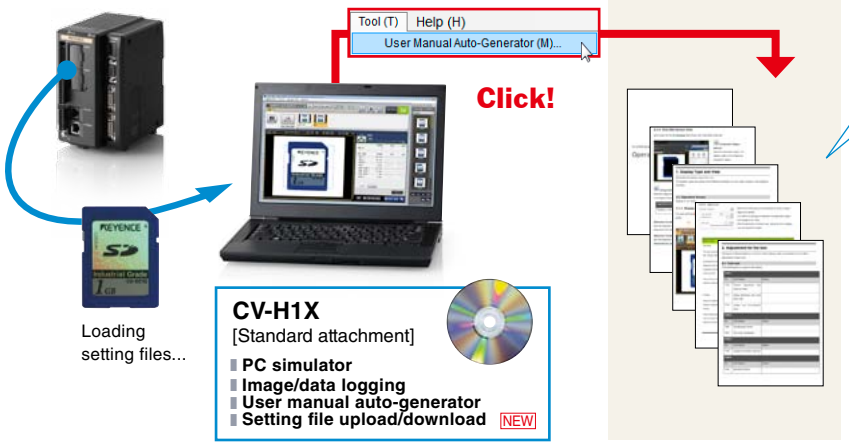
Conventional

An operation manual is required as a reference material for a customer that has had the equipment installed...

I want to have on-site operators refer to the manual but I want to summarise only the functions I need.

User manual auto-generator

Customised manual creation in a single click!

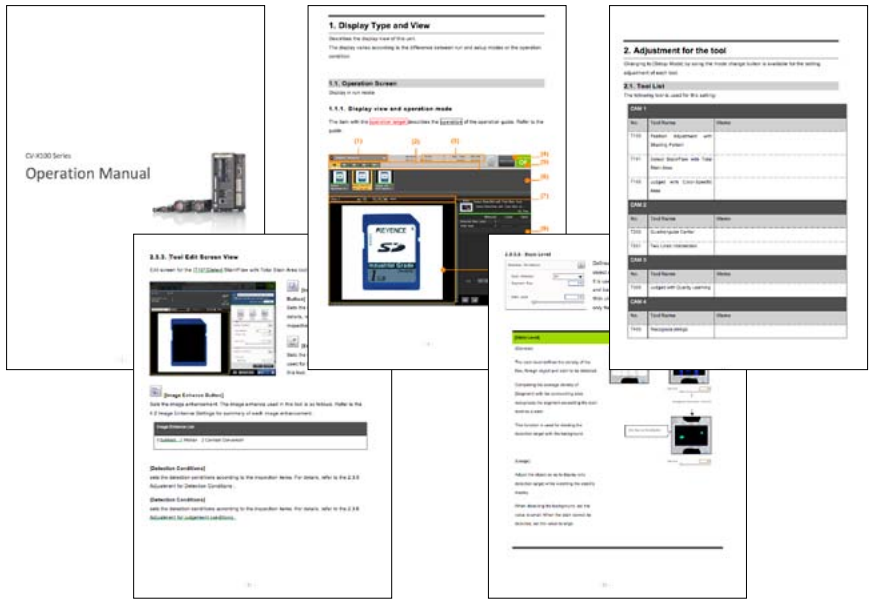


Example of created manual contents

Cover sheet

How to view the operation screen

A list of tools



Basic tool settings

An explanation of the main parameters

Multiple language support

User manuals can be created in ten languages according to languages of setting files.

MS Word output

Outputs in Microsoft Word format. It is possible to freely delete unnecessary part, and add comments.

Tool setting tips

It is possible to insert Tips describing how each tool’s parameter is typically adjusted.

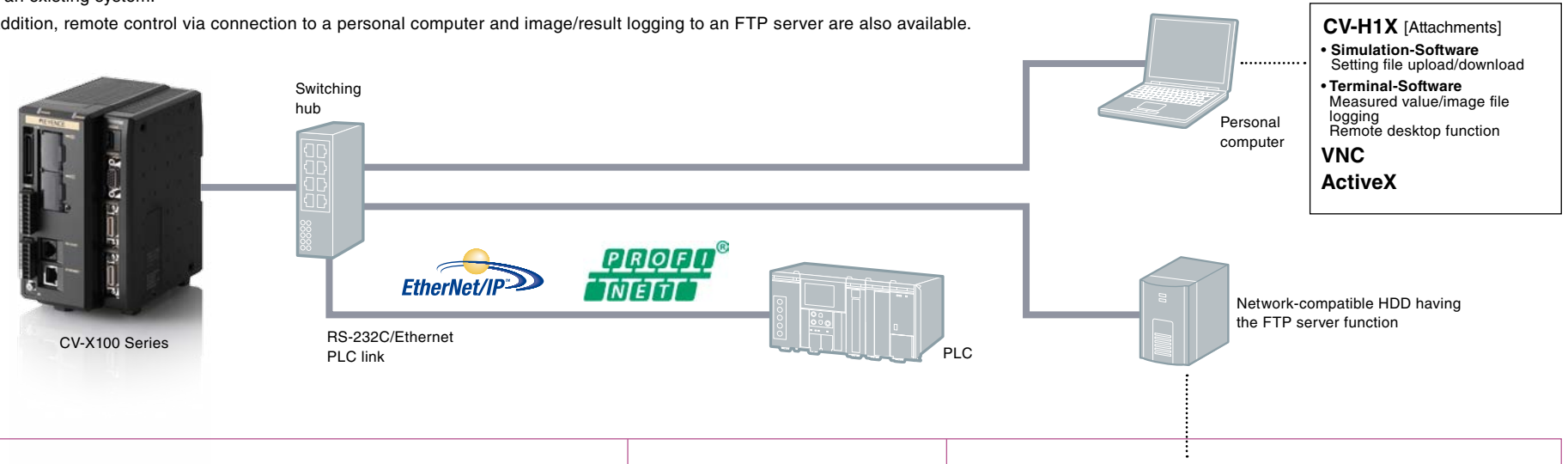
11 Communication and Control

A wide variety of communication methods compatible with existing systems

A wide variety of communication methods are adopted to satisfy communication control needs, including “I want to log image and result data.” and “I want to connect an existing PLC to enable command control.” Various monitor functions useful at start up and other times are also available to “improve operability and security”.

Communication interface

Supports linking to PLCs made by several manufacturers as well as EtherNet/IP and PROFINET, which enables easy integration into an existing system.
In addition, remote control via connection to a personal computer and image/result logging to an FTP server are also available.



PLC link

PLCs made by several manufacturers can be linked via RS-232C/Ethernet.

Supported PLC manufacturers:

KEYENCE: KV Series
Omron: SYSMAC Series
Mitsubishi Electric: MELSEC Series
YASKAWA Electric: MP Series

EtherNet/IP- and PROFINET-compatible

Smart monitor function

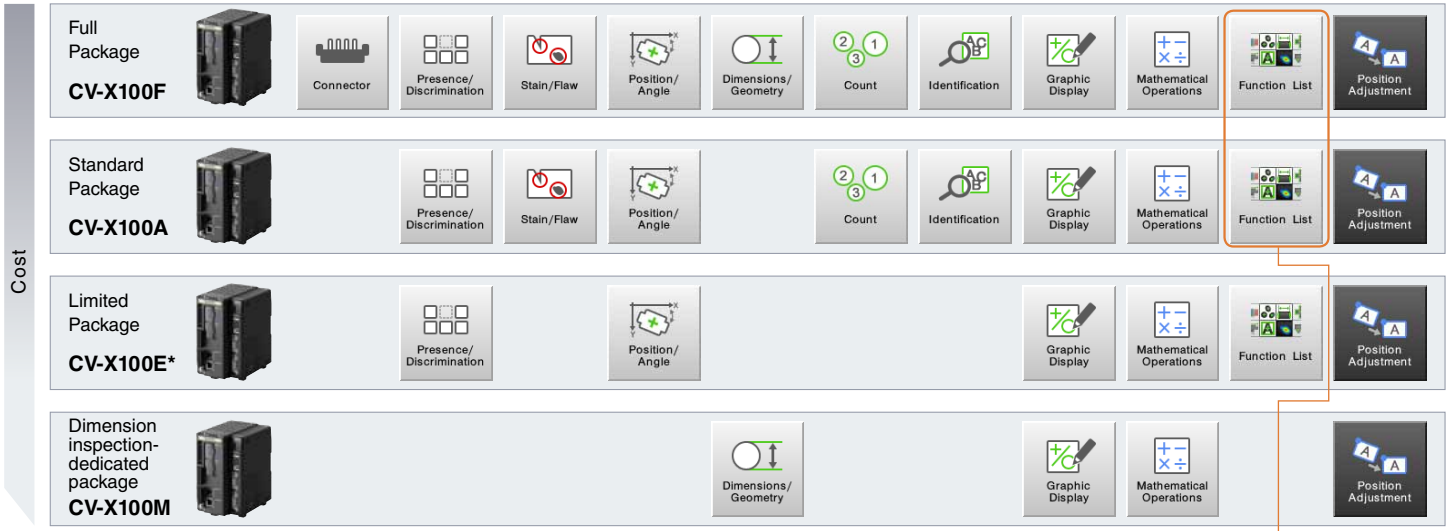
The equipped monitor function checks communication separately for EtherNet/IP and PROFINET so that you can detect problems quickly.

FTP output function

Supports image/measured value output to an FTP server. Images can be saved for a long period of time by connecting a high-capacity HDD having the FTP server function.

A lineup of 10 types according to application

A lineup of 4 types of packages (3 controller grade types for the F, A, and M types) that all have ease-of-use and utilities in common. You can select from a lineup of 10 types according to functions required for inspection and costs.
In addition to conventional display language switching, the character input function also supports multiple languages. It is possible to perform direct input for each language with the features such as the tool names, the custom menu comment function and character strings displayed during operation without switching the language for the system itself.



* The package of the CV-X100E has limited functions. For information on the measurement algorithm and functions provided in this package, contact the nearest KEYENCE office.

Modes since the CV-3000/5000 Series are also included

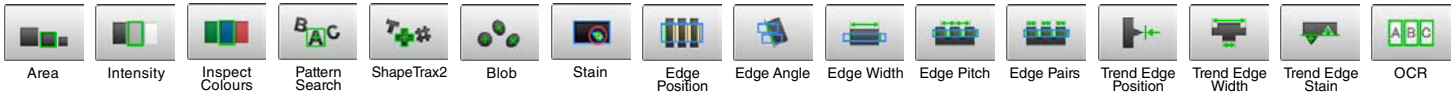
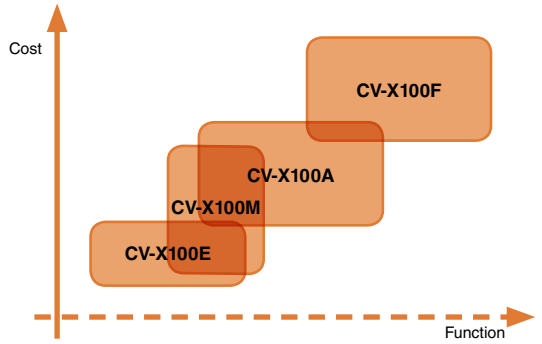


Figure of the whole lineup



List of controller lineup by supported camera

	Supports 310,000 pixel camera	Supports 1 megapixel camera	Supports 2 megapixel camera	Supports 5 megapixel camera
Full Package (Type F)	CV-X100F	CV-X150F		CV-X170F
Standard Package (Type A)	CV-X100A	CV-X150A		CV-X170A
Limited Package (Type E)	CV-X100E			
Dimension inspection-dedicated package (Type M)	CV-X100M	CV-X150M		CV-X170M

16 types of cameras that can be chosen by application

The industry's greatest variety

It is possible to select the best camera according to applications from the greatest variety in the industry, such as a Colour megapixel camera for higher resolution appearance inspection, a 7x camera for inspection that prioritises processing speed, and a compact camera for installation in narrow spaces.

Differences in stain detection capabilities depending on the difference in the number of pixels

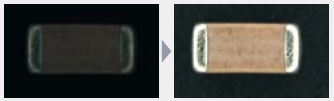
[310,000 pixels]
Detection is absolutely impossible.

[2 megapixel]
The image is blurred and the field of view must be narrowed.

[5 megapixel]
Accurate judgement possible.

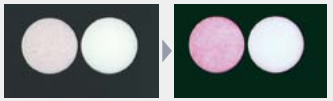
	5 megapixel camera series	2 megapixel camera series			1 megapixel camera series	310,000 pixels camera series		
	11x 5MEGA DIGITAL	7x MEGA DIGITAL	MEGA DIGITAL	SUPER-SMALL DIGITAL	7x MEGA DIGITAL	7x HI-SPEED DIGITAL	HI-SPEED DIGITAL	ULTRA-SMALL DIGITAL
Model	CV-H500M CV-H500C	CV-H200M CV-H200C	CV-200M CV-200C	CV-S200M CV-S200C	CV-H100M CV-H100C	CV-H035M CV-H035C	CV-035M CV-035C	CV-S035M CV-S035C
Specs	11x Monochrome 11x Colour	7x Monochrome 7x Colour	Monochrome Colour	Compact monochrome Compact colour	7x Monochrome 7x Colour	7x Monochrome 7x Colour	Monochrome Colour	Compact monochrome Compact colour
Transfer time	61.2 ms 61.2 ms	29.2 ms 29.2 ms	59 ms 59 ms	59 ms 59 ms	20.5 ms 20.5 ms	4.7 ms 4.7 ms	16.7 ms 16.7 ms	16.7 ms 16.7 ms

Advanced capture with a built-in dedicated IC



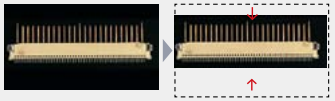
Sensitivity adjustment function

Up to 81 levels of sensitivity adjustment are available. High-speed shutters can be supported by increasing the sensitivity.



Span & shift function

Span adjustment is available to increase the shade difference even for low-contrast objects.



Partial image capture

The image transfer time can be reduced significantly by transferring only a required part of an image.

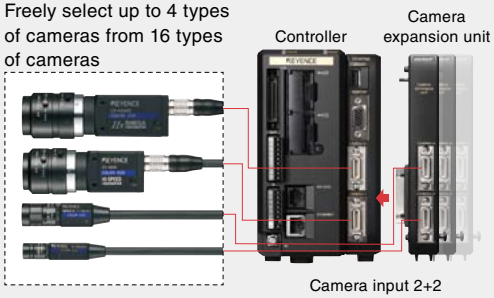
Simultaneous capture multi-camera system

A total of 16 types of cameras can be mixed for use. For example, it is possible to create an optimal camera combination for a single controller according to the detection contents, such as using monochrome for CAM 1 and Colour for CAM 2. Also, by connecting the camera expansion unit, it is possible to connect up to 4 cameras*. Of course, including the 5 megapixel colour camera that holds a vast amount of information, with all cameras combined, it is possible to perform simultaneous image capture and processing with 4 cameras. This makes flexible support possible even in regard to additions or changes to conventional inspection specifications.

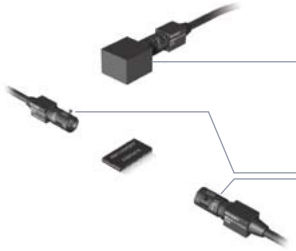
(*The expansion unit can be connected to the CV-X150x/CV-X170x)

Multi-Camera System

Freely select up to 4 types of cameras from 16 types of cameras



Combination examples



CAM 1

Moulding stain inspection, print inspection

2 megapixel compact colour camera + side view unit

CAMs 2, 3

Coplanarity inspection

2 megapixel monochrome compact camera

When performing simultaneous inspection with multiple cameras, it is possible to reduce total system cost by selecting the best cameras according to the inspection contents.

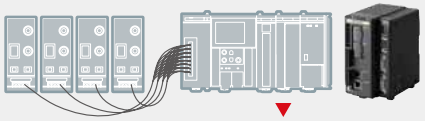
Illumination Expansion Unit

Easy light control without cumbersome wiring

Illumination expansion unit that can be connected to the main unit has been prepared. Up to 4 units*1 can be linked to the controller. A single unit has 2 light connectors and it is possible to connect up to 8 lightings.

*1 A value for CA-DC21E. When CA-DC10E is used, only one unit can be connected.

Problems with conventional methods:
PLC control via a number of I/O is necessary



I/O unnecessary,
and PLC settings are unnecessary!

Illumination Expansion Unit usage examples

Brightness presets for each inspection setting

Automatic light intensity adjustment for each product type

When inspecting workpieces with colours or reflectivity that change for each product type and continuously moving workpieces that do not stop, there are cases where it is impossible to adjust the brightness of the capture screen due to shutter speed changes. To address this, the degree of brightness is preset for each setting No. and the brightness is automatically changed in response to setting No. switches, making it possible to change equipment without making adjustments.

Brightness volume: 127

The optimal brightness for workpieces with low reflectivity...

If left unchanged

Brightness volume: 127

If the brightness volume remains the same, the colours will jump in value when using highly-reflective workpieces.

Switched to preset

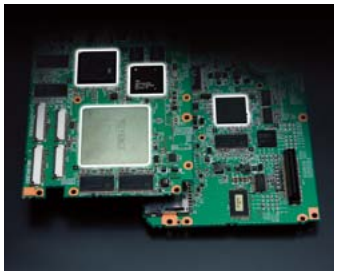
Brightness volume: 80

By presetting the best brightness volume according to the product type, equipment changeover will be completed with ease.

Ultra high-speed/parallel processing, “3+1” processor

Fastest in its class

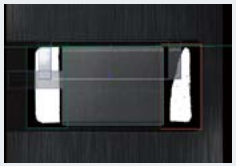
Though there are many systems that perform processing by combining the CPU with an ASIC for image capture, KEYENCE has placed emphasis on a parallel processing system in order to constantly produce top performance under constant conditions. In addition to the “A. C. E. II” high speed, large capacity colour image processing engine that conducts colour processing, by creating a combination that includes two DSP units (an image processing DSP and an image display DSP) and an RISC-CPU that handles total control and communication, stabilised high-speed processing has been achieved.



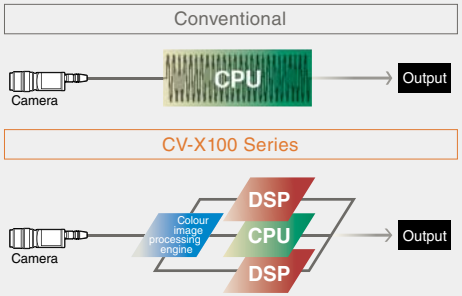
Example of ultra high-speed processing

Electric component appearance inspection trigger interval in 3 ms

A 7x high-speed 310,000 pixel Colour camera set to load 240 lines, an inspection composed of 3 tools, edge angle (position adjustment), area and colour stain.



Comparison with conventional processing processes

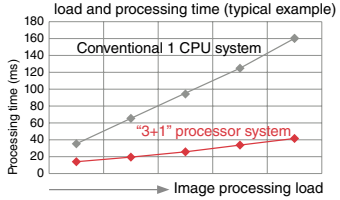


Achieves high speeds by sharing the image processing task among multiple processors.

A comparison of processing time between the “3+1” processor system and a 1 CPU system

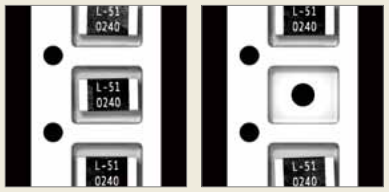
*The image processing load is enlarged for the following workpieces.
– Detail the parameters for search or stain inspection.
– Increasing the amount of image enhancement.
– Increasing the amount of camera pixels.

Relationship between image processing load and processing time (typical example)



Presence/Discrimination

IC presence inspection in carrier tape



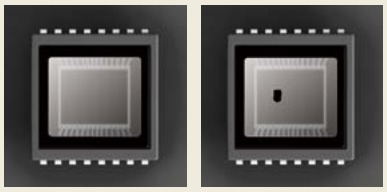
OK product | Missing IC

Seal density inspection for capacitor

OK product | NG product

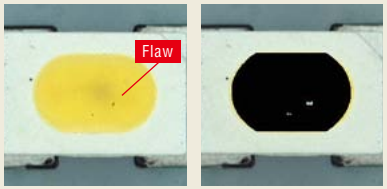
Stain/Flaw

CCD stain inspection



OK product | NG product

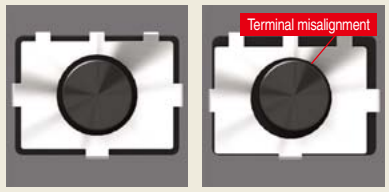
LED appearance inspection



NG product | Contrast image

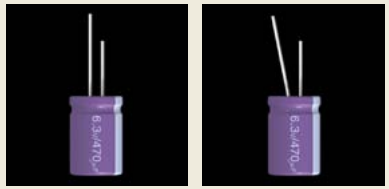
Position/Angle

Positioning inspection for switch terminal



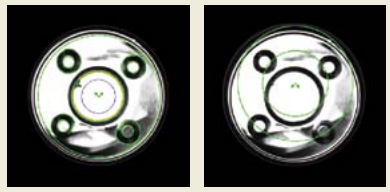
OK product | NG product

Defective lead inspection for capacitor



OK product | NG product

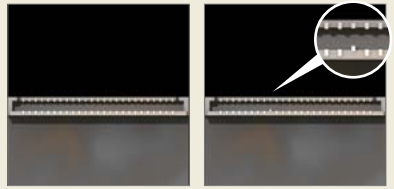
Angle detection of HDD top clamps



ShapeTrax2 detection succeeded | Pattern search detection failure

Connector

Connector coplanarity inspection



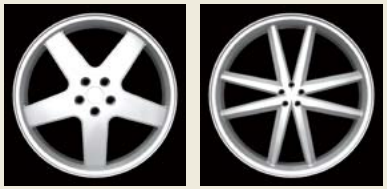
OK product | NG product

Presence/ Discrimination

False assembly inspection for fuse boxes

OK product NG product

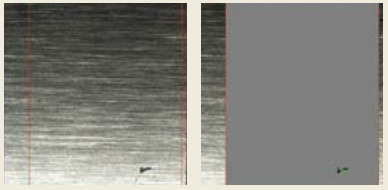
Type discrimination for wheels



OK product Different type

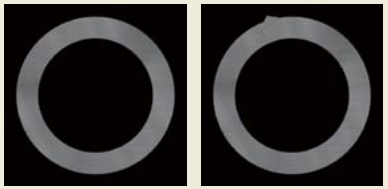
Stain/Flaw

Stain/flaw inspection for steel plates



NG product Image after filtering

Burr inspection for washers

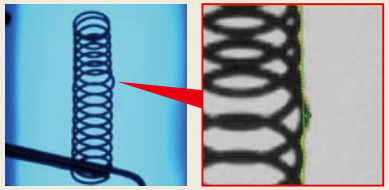


OK product NG product

Appearance inspection for bearings

NG product Magnified image

Appearance shape inspection for springs



NG product Magnified image

Position/Angle

Performance inspection for speedometer

OK product NG product

Positioning detection for O-rings

OK product NG product

Latest application cases **Food/Pharmaceuticals/Containers**

Presence/Discrimination

Presence inspection for instant noodle's ingredients

OK product

NG product

Variant mixed-in inspection for caps

OK product

NG product

Stain/Flaw

Appearance inspection for a cap

OK product

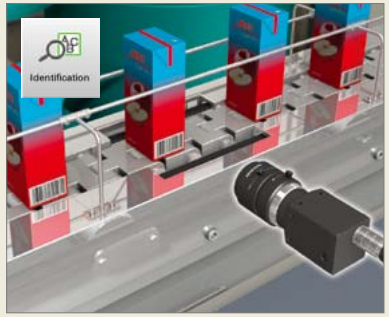
NG product

Flaw inspection for mouth of glass bottle

NG product

Identification

Barcode reading for paper packaging



OK product

NG product

Text recognition of best before date

OK product

NG product

Count

Checking the number of sheets for packaging materials

OK product

NG product

Position/Angle

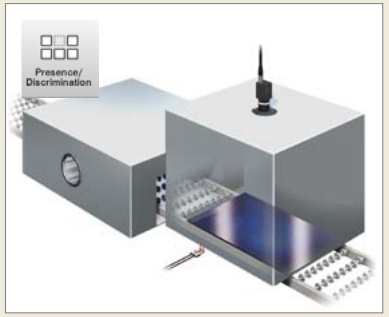
Positioning inspection for labels

OK product

NG product

Presence/Discrimination

Discrimination of cell colour

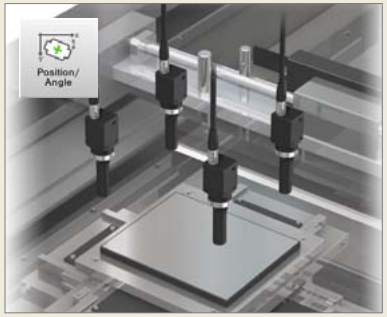


OK product

NG product

Position/Angle

Glass substrate alignment



Before alignment

After alignment

Dimensions/Geometry

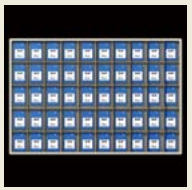
Bend inspection for IC leads

NG product

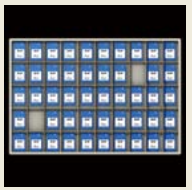
Magnified image

Count

Counting the number of SD cards



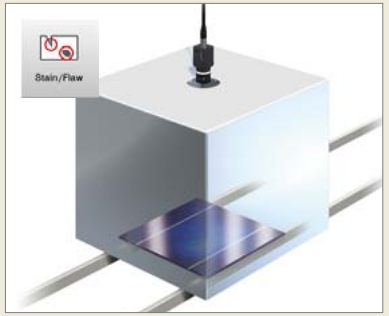
OK product

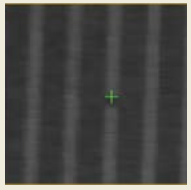


NG product

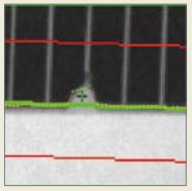
Stain/Flaw

Appearance inspection of a cell





Cuts on electrode printing



Chipped edge

Position/Angle

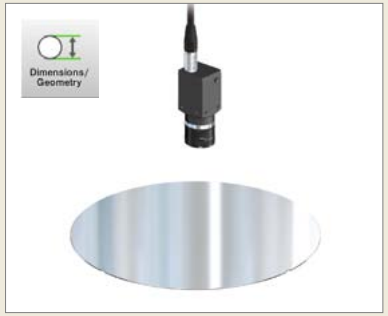
Cell alignment

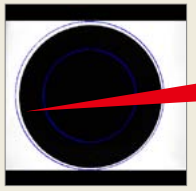
Before alignment

After alignment

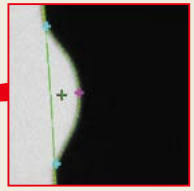
Dimensions/Geometry

Wafer alignment





Full image



Magnified image

Identification

2D code reading on a mould

OK product

NG product

Rich interface to enhance compatibility with external devices

Large capacity twin SD card saving

Supports SDHC standards*, and it is possible to save to a large capacity 4 GB card. It also includes 2 slots as standard. A total capacity of 8 GB can be used, and it is possible to save large data files or NG screen data at high-speeds.

* In order to read and write SDHC standard SD cards on a PC, please prepare a specialised cartridge (commercially available).

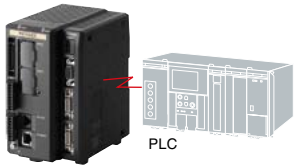
Illumination Expansion Unit connection

Connects the CA-DC21E or CA-DC10E Illumination Expansion Unit

Illumination Expansion Unit
CA-DC21E

Ethernet PLC-Link function

Supports Ethernet PLC-Link, EtherNet/IP, and PROFINET. Ultra high-speed communication is possible with no ladder necessary.



Camera connection unit

The camera cable connection unit is placed in a recessed area to minimise dead space when installing the control panel.

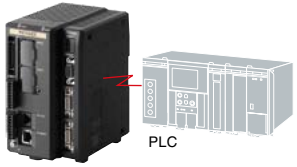
Camera expansion unit connection

Connect the CV-E500 camera expansion unit when using 3 or 4 cameras.

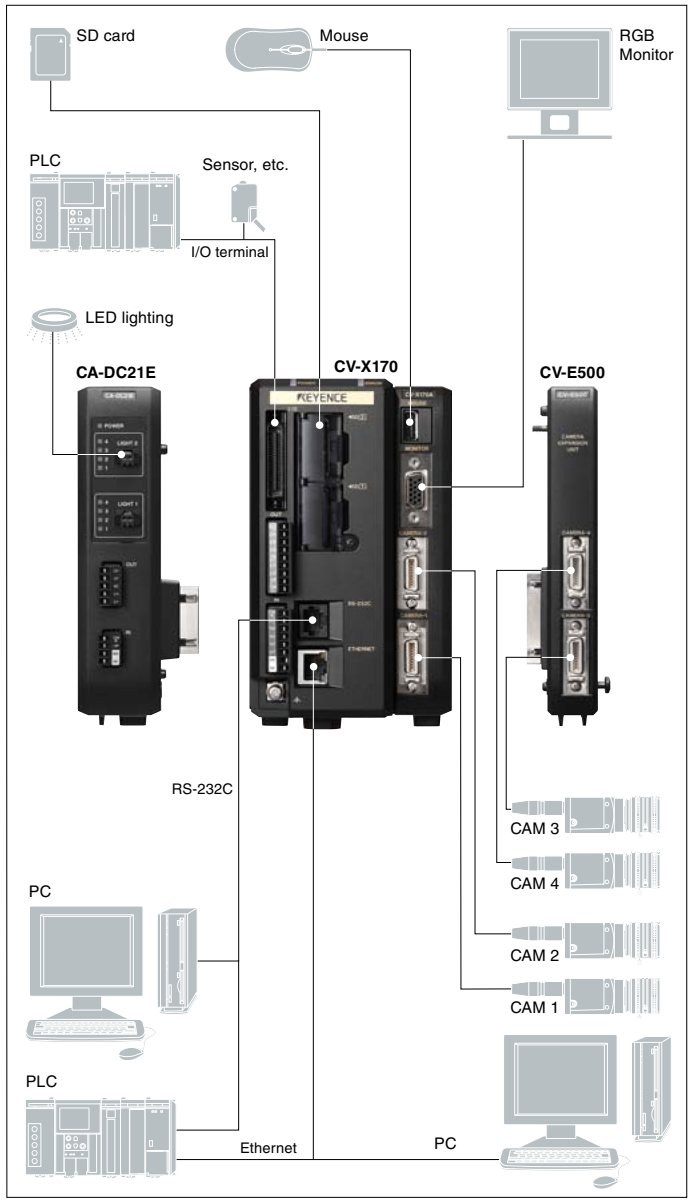
Camera expansion unit
CV-E500

RS-232C communication

It is possible to connect KEYENCE KV Series PLC-Link or PLC-Links from other companies. Direct communication can be performed with PLC data memory without a need for ladders.



System Configuration



Controller

Supports 5 megapixel cameras
Ultra high-speed, high-capacity type
CV-X170

Supports 2 megapixel cameras
High-speed type
CV-X150

For 310,000 pixels only
CV-X100

Camera expansion unit
CV-E500

Illumination expansion unit
CA-DC21E
CA-DC10E

* The picture shows CA-DC21E.

Accessories

Mouse (Accessory)

PC software DVD-ROM
CV-H1X (Accessory)

Windows XP
(Professional/Home Edition SP2 or later)
Windows Vista
(Enterprise/Ultimate/Business/Home Premium/
Home Basic)
Windows 7
(Home Premium/Professional/Ultimate/Enterprise)

Supported OS languages: English, Japanese, Chinese (Simplified and Traditional), Korean, Thai, German, French, Italian, and Spanish
Supports the 64-bit version for Microsoft Windows 7 only. For all other operating systems, only the 32-bit version is supported.

Monitor

XGA monitor
CA-MP120

Monitor stand for CA-MP120
OP-87262

RGB monitor cable
OP-66842 (3 m)
OP-87055 (10 m)

Communication cable

Extension I/O cable
OP-51657 (3 m)

Communication cable conversion connector
For 9-pin OP-26486
For 25-pin OP-26485
For 9-pin SYSMAC OP-84384
For 9-pin MELSEC OP-86930
For 9-pin MELSEC FX OP-26486

RS-232C communication cable
OP-26487 (2.5 m)

Ethernet cable
OP-66843 (3 m)

Area camera

11x
5 megapixel camera
CV-H500C (Colour)
CV-H500M (Monochrome)

7x
2 megapixel camera
CV-H200C (Colour)
CV-H200M (Monochrome)

7x
1 megapixel camera
CV-H100C (Colour)
CV-H100M (Monochrome)

7x
310,000 pixel camera
CV-H035C (Colour)
CV-H035M (Monochrome)

2 megapixel camera
CV-200C (Colour)
CV-200M (Monochrome)

310,000 pixel camera
CV-035C (Colour)
CV-035M (Monochrome)

Ultra-compact camera
2 megapixel camera
CV-S200C (Colour)
CV-S200M (Monochrome)

Ultra-compact camera
310,000 pixel
CV-S035C (Colour)
CV-S035M (Monochrome)

Other

Dedicated 24 VDC power source
CA-U3

Mouse stand
OP-87601

SD card (industrial-grade)
4 GB CA-SD4G (SDHC)
1 GB CA-SD1G
512 MB OP-87133

Camera mounting stage
CA-S2040

Setup manual for the CV-X100
OP-M1840

User manual for the CV-X100
OP-M1845

The Setup manual/user manual for the CV-X100 Series is not included with the controller.

Optional accessories

Camera cable

L-type connector

[List of models]

Cable type	Connector shape	Cable length					
		1 m	3 m	5 m	10 m	17 m	Extension cable
Standard	Straight	CA-CN1	CA-CN3	CA-CN5	CA-CN10	CA-CN17	—
	L-type	—	CA-CN3L	CA-CN5L	CA-CN10L	CA-CN17L	—
High-flex cable	Straight	—	CA-CN3R	CA-CN5R	CA-CN10R	CA-CN17R	CA-CN7RE (7 m)
For high-speed camera	Straight	—	CA-CH3	CA-CH5	CA-CH10	—	—
	L-type	—	CA-CH3L	CA-CH5L	CA-CH10L	—	—
High-flex for high-speed camera	Straight	—	CA-CH3R	CA-CH5R	CA-CH10R	—	—

Camera Cable Compatibility List

Connectable cameras / Number of pixels		Area Camera			
		5 megapixel	2 megapixel	1 megapixel	310,000 pixels
For high-speed camera	CA-CH10	X	X	X	X
	CA-CH5	X	X	X	X
	CA-CH3	X	X	X	X
For normal cameras	CA-CN17	-	-	-	X
	CA-CN10	-	X	-	X
	CA-CN5	-	X	-	X
	CA-CN3	-	X	-	X
	CA-CN1	-	X	-	X

Repeater for camera cable extension
CA-CNX10U
(for normal cameras)
CA-CHX10U
(for high-speed cameras)

Camera cable extension is possible at a max length of 51 m or 30 m*.

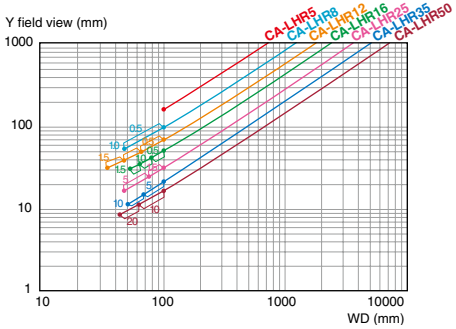
*** The maximum length will differ according to the camera model. Contact KEYENCE for details.**

A dedicated extension cable is required for repeater ⇔ camera or repeater ⇔ repeater. Contact KEYENCE for details.

* Microsoft and Windows are the registered trademark or trademark of the Microsoft Corporation in the United States and/or other countries.

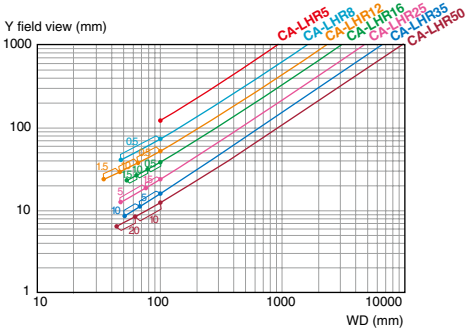
Field of view graph

▮ CV-H500C/CV-H500M
(When the CA-LHR Series is equipped)



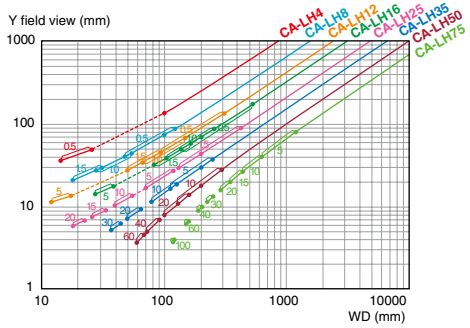
* Using close-up rings may reduce the accuracy of the periphery image.

▮ CV-200C/CV-200M/CV-H200C/CV-H200M
(When the CA-LHR Series is equipped)

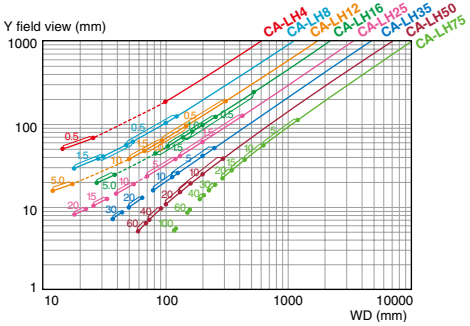


* Using close-up rings may reduce the accuracy of the periphery image.

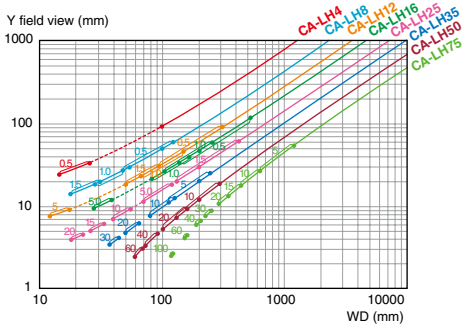
▮ CV-200C/CV-200M/CV-H200C/CV-H200M
(When the CA-LH Series is equipped)



▮ CV-H100C/CV-H100M
(When the CA-LH Series is equipped)

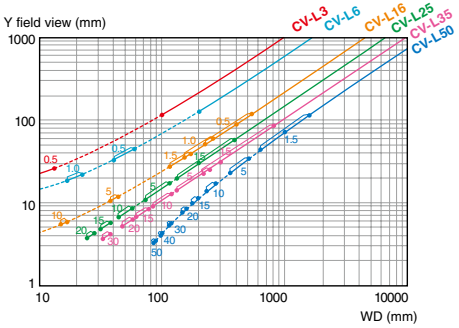


▮ CV-035C/CV-035M/CV-H035C/CV-H035M
(When the CA-LH Series is equipped)

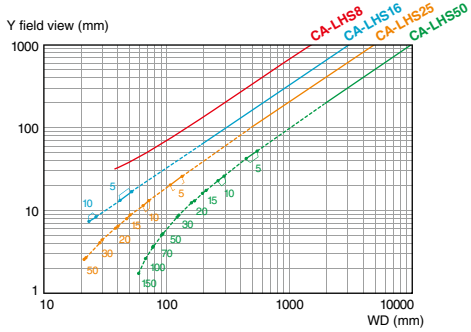


1/3" 640 x 480
(When the CV-035C/M or CV-H035C/M is equipped)

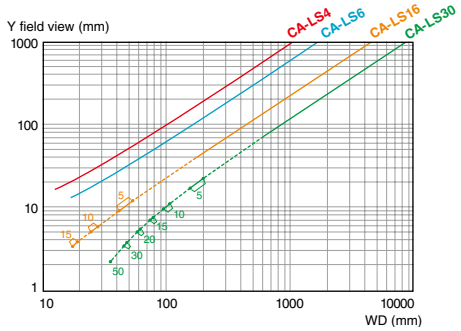
▮ CV-035C/CV-035M/CV-H035C/CV-H035M
(When the CV-L Series is equipped)



▮ CV-S200C/CV-S200M
(When the CA-LHS Series is equipped)



▮ CV-S035C/CV-S035M
(When the CA-LS Series is equipped)



The numerical values in these graphs are just reference values.
Therefore, adjustment may be necessary when installation is performed.

Specifications (Controller)

Controller model*1*2			CV-X170	CV-X150	CV-X100
Number of pixels			With CV-H500C/H500M connected • 5,000,000-pixel mode: 2432 (H) x 2050 (V), approx. 4.99 megapixel With CV-200C/S200C/H200C/200M/S200M/H200M connected • 2,000,000-pixel mode: 1600 (H) x 1200 (V), 1.92 megapixel • 1,000,000-pixel mode: 1024 (H) x 960 (V), approx. 980,000 pixels With CV-H100C/H100M connected • 1,000,000-pixel mode: 1000 (H) x 1000 (V), 1 megapixel With CV-035C/S035C/035M/S035M/H035C/H035M connected • 310,000-pixel mode: 640 (H) x 480 (V), approx. 310,000 pixels • 240,000-pixel mode: 512 (H) x 480 (V), approx. 240,000 pixels	With CV-200C/S200C/H200C/200M/S200M/H200M connected • 2,000,000-pixel mode: 1600 (H) x 1200 (V), 1.92 megapixel • 1,000,000-pixel mode: 1024 (H) x 960 (V), approx. 980,000 pixels With CV-H100C/H100M connected • 1,000,000-pixel mode: 1000 (H) x 1000 (V), 1 megapixel With CV-035C/S035C/035M/S035M/H035C/H035M connected • 310,000-pixel mode: 640 (H) x 480 (V), approx. 310,000 pixels • 240,000-pixel mode: 512 (H) x 480 (V), approx. 240,000 pixels	• 310,000-pixel mode: 640 (H) x 480 (V), approx. 310,000 pixels • 240,000-pixel mode: 512 (H) x 480 (V), approx. 240,000 pixels
Camera input			2 Colour/monochrome cameras (Supports CV-H500C/200C/S200C/H200C/H100C/035C/S035C/H035C/H500M/200M/S200M/H200M/H100M/035M/S035M/H035M, mixed connection possible)	2 Colour/monochrome cameras (Supports CV-200C/S200C/H200C/H100C/035C/S035C/H035C/200M/S200M/H200M/H100M/035M/S035M/H035M, mixed connection possible)	2 Colour/monochrome cameras (Supports CV-035C/S035C/H035C/035M/S035M/H035M, mixed connection possible)
	Number of connected units		Supports 2 camera expansion and simultaneous capture with up to 4 cameras via connection with the CV-E500 expansion unit		Simultaneous/individual capture with 2 cameras is possible
Main processor for image processing			DSP (High-Speed)	DSP (Medium)	DSP (Standard)
Number of setting registrations			Up to 1000 settings (depending on SD card capacity and setting contents) for SD card 1 and SD card 2 individually and external switching is possible		
Number of reference images			Each setting supports 900 images per camera (depending on SD card capacity), compress and save functions and image registration of position adjusted images.		
Memory card			• SD card slot x2 (SDHC compatible) • Supports OP-87133 (512 MB: standard equipment on the SD1 slot for the CV-X150/X100), CA-SD1G (1 GB: standard equipment on the SD1 slot for the CV-X170), CA-SD4G (4 GB)		
Camera Settings			• Shutter speed adjustment • Sensitivity adjustment (1.0 to 9.0)		
	Trigger		• Supports external triggers (TRG1 to 4) and internal triggers • Supports pre-capture • Supports trigger delays for each camera • Supports random triggers		
	Capture area settings	Processing area setting function	• Possible to specify a 980,000-pixel area (1024 (H) x 960 (V)) in any position as the image processing area within 1,920,000 pixels (1,000,000-pixel mode) • Possible to specify a 240,000-pixel area (512 (H) x 480 (V)) in any position as the image processing area within 320,000 pixels * (standard mode) * 310,000 pixels when CV-H035C/H035M is connected		• Possible to specify a 240,000-pixel area (512 (H) x 480 (V)) in any position as the image processing area within 320,000 pixels * * 310,000 pixels when CV-H035C/H035M is connected
		Scanning method (only when a monochrome camera is connected)	Switches between progressive/interlace		
		Capture start/end line setting function	• Can set an arbitrary capture start/end line within the image capture range. (The CV-H200C and H200M do not allow less than 100 lines to be captured)		
	Calibration		• Corrects lens and perspective distortion on the current image through calibration using calibration patterns (only when a monochrome camera is connected and in progressive mode) • Possible to print calibration patterns.		
	HDR		Possible to improve the problems of blocked up shadows and blown out highlights, adjust brightness and contrast, and support multiple image capture		
	Multi-Capture		Up to 8 images		
	Gain adjustment		Offset (-255 to +255), Span adjustment (0.0 to 7.9)		
	White balance		Manual setting with white target		
	Lighting		Capable of lighting and adjustment to light intensity for each camera (When using the CA-DC21E)		
Number of tools that can be set			Up to 100 for each camera		
Tools	Common specifications	Inspection region (Supported regions will differ depending on the tool)	• Shapes include: rectangle, rotated rectangle, circle, oval, ring, arc, and polygon (up to 12 angles) • 4 regions per tool can be set for the mask region		

Controller model*1*2			CV-X170	CV-X150	CV-X100
Tools	Common specifications	Image enhance (will be varied depending on the tool)	• Types: expand, shrink, remove bright noise, remove dark noise, average, median, sharpen, sobel X, sobel Y, sobel, prewitt, roberts, laplacian, binary (only for area and blob), subtraction, preserve intensity, contrast conversion, image extraction, shading correction, blur • Count: Repetition of the same type (up to 9 times) (only once for binary, subtraction, preserve intensity, contrast conversion, Image extraction, shading correction, and blur), 13 levels (for binary and subtraction, 1 level per tool)		
		Extract colours (Only with Colour camera connected)	• Colour to binary, colour to greyscale, fine colour, grey (Colour corresponds to numeric value specified by HSB values, fine colour can be selected only for stain tool)		
		Display options	• Edge graph, detect position, detect edge (profile, segment, connector dimension graph), pattern region, registered feature, input feature, dimension line display • Supports line thickness and colour settings		
		Origin coordinates	Origin coordinate, detection point		
	Presence/Discrimination		Auto-teach, black/white-specific area, colour-specific area, shading pattern, profile pattern, shading, colour component		
	Stain/Flaw		Auto-teach, total stain area, each stain, black & white area, flaw on a line, flaw on a ring, flaw on a curve		
	Position/Angle		Shading pattern position, profile pattern position, edge position, position and angle of line, centre position of circle, edge slope, edge position to circumference, tip position, cluster position		
	Dimensions/Geometry	Measure distance	Points distance, point/Line distance, lines distance, point/circle distance, line/circle distance, circles distance		
		Measure width	Edge width, width (max./min.), diameter (max./min.), centre pitch, gap pitch, gap pitch (edge pairs), points distance, peak-to-peak width		
		Line/Angle	Line along with profile, line passing two points, bisection of two lines, angle formed by two lines		
		Intersection/Centre	Line/v-line intersection, two lines intersection, centre of quadrangle, midpoint of points		
		Detect circle	Circle along with profile, circle passing three points		
		Detect point	Shading pattern position, profile pattern position, edge position, tip position, gravity centre of cluster		
	Count		Cluster, edge, shading pattern, profile pattern		
	Identification		Characters, 1D code, 2D code		
	Graphic display		Line display, circle display, point display, scale display		
	Mathematical Operations		• Sets multiple calculation formulas with line breaks and up to 5000 characters can be entered directly with support for comment entry • Supports time-out settings • Mathematical operator, logic operator, comparison operator, mathematical function, trigonometric function, geometric function, calendar function, bit function, statement • Supports judgement through answers ANS0, ANS1, ANS2 • Supports display of calculation formula errors • Supports temporary variables		
	Connector		Dimension inspection, appearance inspection (Area), appearance inspection (Intensity), appearance inspection (Stain), appearance inspection (Blob), appearance inspection (trend edge position), appearance inspection (trend edge width) and position adjustment		
	Function List		Auto-Teach inspection, area, pattern search, ShapeTrax2, edge position, edge angle, edge width, edge pitch, edge pairs, stain, blob, trend edge position, trend edge width, trend edge stain, intensity, inspect colours, OCR, 1D code reader, 2D code reader, Auto-Teach inspection (pattern search)		
	Position Adjustment		Connector position, Shading pattern position, profile pattern position, edge position, line position and angle, centre of circle, gravity centre of cluster		
Utility	Scaling		• Can set correction values for each camera • Can select to turn correction ON/OFF for each tool		
	Operation screen settings		• 10 operation screen/1 inspection setting • Supports selection from the template catalogue • Supports automatic addition of measurement results		
	Archived image settings		• Can store the image amounts listed below as an archive to the image memory for the main unit • Supports two archive conditions: auto, total status NG		
		Archive condition (automatic)	• Max. 506 images (Monochrome camera, 240,000 pixels) • Max. 250 images (Monochrome camera, 310,000 pixels) • Max. 122 images (Monochrome camera, 1,000,000 pixels) • Max. 58 images (Monochrome camera, 2,000,000 pixels) • Max. 19 images (Monochrome camera, 5,000,000 pixels) • Max. 501 images (Colour camera, 240,000 pixels) • Max. 247 images (Colour camera, 310,000 pixels) • Max. 117 images (Colour camera, 1,000,000 pixels) • Max. 54 images (Colour camera, 2,000,000 pixels) • Max. 15 images (Colour camera, 5,000,000 pixels)	• Max. 250 images (Monochrome camera, 240,000 pixels) • Max. 122 images (Monochrome camera, 310,000 pixels) • Max. 58 images (Monochrome camera, 1,000,000 pixels) • Max. 26 images (Monochrome camera, 2,000,000 pixels) • Max. 245 images (Colour camera, 240,000 pixels) • Max. 119 images (Colour camera, 310,000 pixels) • Max. 53 images (Colour camera, 1,000,000 pixels) • Max. 22 images (Colour camera, 2,000,000 pixels)	• Max. 250 images (Monochrome camera, 240,000 pixels) • Max. 122 images (Monochrome camera, 310,000 pixels) • Max. 245 images (Colour camera, 240,000 pixels) • Max. 119 images (Colour camera, 310,000 pixels)

Specifications (Controller)

Continued from pg. 31

Controller model*1*2			CV-X170	CV-X150	CV-X100
Utility	Archived image settings	Archive condition (total status NG)	• Max. 1001 images (Monochrome camera, 240,000 pixels) • Max. 489 images (Monochrome camera, 310,000 pixels) • Max. 233 images (Monochrome camera, 1,000,000 pixels) • Max. 105 images (Monochrome camera, 2,000,000 pixels) • Max. 35 images (Monochrome camera, 5,000,000 pixels) • Max. 992 images (Colour camera, 240,000 pixels) • Max. 484 images (Colour camera, 310,000 pixels) • Max. 224 images (Colour camera, 1,000,000 pixels) • Max. 97 images (Colour camera, 2,000,000 pixels) • Max. 27 images (Colour camera, 5,000,000 pixels)	• Max. 489 images (Monochrome camera, 240,000 pixels) • Max. 233 images (Monochrome camera, 310,000 pixels) • Max. 105 images (Monochrome camera, 1,000,000 pixels) • Max. 46 images (Monochrome camera, 2,000,000 pixels) • Max. 480 images (Colour camera, 240,000 pixels) • Max. 228 images (Colour camera, 310,000 pixels) • Max. 96 images (Colour camera, 1,000,000 pixels) • Max. 39 images (Colour camera, 2,000,000 pixels)	• Max. 489 images (Monochrome camera, 240,000 pixels) • Max. 233 images (Monochrome camera, 310,000 pixels) • Max. 480 images (Colour camera, 240,000 pixels) • Max. 228 images (Colour camera, 310,000 pixels)
			• Supports output of archived image to SD cards, PC programme and FTP server • Supports output to folders for each camera • For image output, it is possible to select from three options: always, CAM judgement NG images only, or total status NG only • Supports image output preferred setting		
	Image Strip settings		Supports download of external image files (SD card, FTP)		
	Security settings		• A password between 4 and 32 characters can be set and it is possible to enter capital and lowercase characters as well as numbers and symbols • Supports controller ID lock, and up to 100 controller IDs can be registered		
	Update reference value		Can execute recalculation of the reference values		
	Custom menu		• Max. 100 items per camera • Supports registration by selecting items		
	Connector adjustment menu		Enables component changes for previously set connector tools and provides navigation for product type expansion adjustment procedures		
	Tool Adjustment Navigation		Filters images that should essentially be OK out of those that have been judged as NG to adjust mis-judgement		
	Auto-teach inspection adjustment navigation		Filters images that should essentially be OK out of those that have been judged NG by Auto-Teach Inspection and then teaches these images in additions		
	Camera installation replication		Reproduces the capture environment that existed when the reference image was captured		
	Statistics	Amount of data	Max 20,000 pieces of data per item, max. 128 items (supports batch saving to SD card)		
		Statistical items	Max. value, min. value, average value, deviation (3σ), OK/NG count in total status, yield, process capability index (Cpk, Cpu, Cpl)		
		Type	Measured list, trend graph, histogram, process monitor		
	Batch test		Supports batch test for archived images		
	I/O monitor		• Updates the state of the I/O terminal in real-time • Supports forced output		
	RS-232C monitor		• Updates communication contents in real-time • Supports saving communication logs to SD card		
	EtherNet/IP memory monitor		• Updates communication contents in real-time • Supports forced output		
	PROFINET memory monitor		• Updates communication contents in real-time • Supports forced output		
	Change account		Admin/Operator/User		
	Manage files		Supports file control with up to 1024 files		
	Remove SD Card2		Used to eject SD card 2		
	Tolerance overwrite function		The specified judgement conditions and stain levels can be rewritten during operation.		
	Share judgement condition		Judgement conditions can be shared between tools that have been set (the sharing group has an upper limit of 100 tools).		
	Connector shared data management		Supports copying, deleting, and renaming of shared connector data		
Global settings			• Communications & I/O (network/external terminal/PLC-Link/RS-232C/FTP/VNC/EtherNet/IP and PROFINET) • Camera common (run screen update mode/lighting configuration/white balance settings) • System (controller name/reference image file type/image capture settings/mouse settings/error output settings) • startup mode setting, set account, date & time, language, reboot, system information		
Output settings	Judgement settings		Supports the selection of tools for CAM judgement and partial judgement A max. of 100 groups can be used for partial judgement		
	OR terminal		Supports the selection of terminal output status when outputting total status from the OR terminal		
	OUT terminal		Supports the setting of items output from the parallel I/O connectors (OUT 6 to OUT 21) for tool, intra-tool, partial, and CAM judgement values		
	RS-232C (non-procedural)		Supports the selection of output items when outputting non-procedural results with RS-232C (max. 256 items)		
	Ethernet (non-procedural)		Supports the selection of output items when outputting non-procedural results with Ethernet (max. 256 items)		
	SD card 2		Supports the selection of output items when outputting results to SD card (max. 256 items)		
	PC programme		Supports the selection of output items when outputting results to PC programme (max. 256 items)		
	PLC-Link		Supports the selection of output items when outputting results with PLC-Link (RS-232C/Ethernet) (max. 256 items)		
	EtherNet/IP		Supports the selection of output items when outputting results with EtherNet/IP (max. 64 items for bit allocation and max. 256 items for byte allocation)		
	PROFINET		Supports the selection of output items when outputting results with PROFINET (max. 64 items for bit allocation and max. 256 items for byte allocation)		
	FTP		Supports the selection of output items when outputting results to an FTP server (max. 256 items)		
	Image output		Supports settings for image output to PC programme, FTP servers or SD card		
Support functions	Setting auxiliary functions	Screen display Maximise/minimise	Possible within a range of 4% to 2500% when operating, the display position the measurement position (Individual zoom settings are possible when displaying multiple screens)		
		Edge differential Display waveform	Can display edge differentiated waveform graphics with measurement values during operation		
		Profile Display	Can display all detect position graphics for trend edge position and width during operation		
		Contrast	Can display graphics for stain detection (stain level) during operation		

Controller model*1*2			CV-X170	CV-X150	CV-X100
Support functions	Setting assist functions	Cutout projection Waveform display	OCR automatic cutout projection waveform graphics can be displayed during operation		
		Defect level Waveform display	The stain level wave of trend edge stain can be displayed during operation		
		Feature display	Can display registered/input feature for ShapeTrax2 during operation		
		Connector dimension Graphical display	Connector dimensional graphics can be displayed during operation		
	SD card saving function		Supports measured values, judgement results, measurement images (can be compressed), archived images (can be compressed), captured images, statistics data, RS-232C communication logs, and setting contents, direct saving during inspection operations (not including setting contents programmes)		
	Context menu		Image capture function, change user account function, reset, remove SD Card 2		
Interface	Control input	External Trigger Input	4 points (2 of which support special function assignment) Input rating: 26.4 V max., 3 mA min, can select from simultaneous/individual capture with up to 4 cameras (While the CV-E500 is disconnected, simultaneous capture is performed with up to 2 cameras in total)	4 points (2 of which support special function assignment) Input rating: 26.4 V max., 3 mA min, can select from simultaneous/individual capture with up to 4 cameras (While the CV-E500 is disconnected, simultaneous capture is performed with up to 2 cameras in total)	4 points (2 of which support special function assignment) Input rating: 26.4 V max., 3 mA min., simultaneous/individual capture with up to 2 cameras is possible
			Can set individual trigger delays (0 to 999 ms) for each trigger input		
		Control input	16 points (4 of which support special function assignment) Input rating: 26.4 V max., 2 mA min.		
	Control output	Common output	27 points (10 of which support special function assignment, includes 4 high speed outputs), NPN open collector, 50 mA max. (30 V max.), the high-speed output terminal is 3 mA min.		
		Total status output	1 point, NPN open collector, 50 mA max. (30 V max.) Supports total status hold control, one-shot output (1 to 9999 ms)		
	Monitor output		Analogue RGB output XGA 1024 × 768 (24 bit colour, 60 Hz)		
	Operation indicator		Power ERROR LED display		
	RS-232C		Can perform numerical value output and control I/O, supports a max. baud rate of up to 115200 bps (Cannot be used with PLC-Links using the RS-232C port)		
	PLC-Link		• Can output numerical values and perform control input/output using the Ethernet or RS-232C port (EtherNet/IP and PROFINET are exclusively used with PLC-Link. When using the RS-232C port, non-procedural RS-232C communication is exclusively used with PLC-Link.) • The following PLCs are supported via link unit: *3 KEYENCE: KV-700 Series, KV-1000 Series, KV-3000 Series, KV-5000 Series, KV-5500 Series Mitsubishi Electric: MELSEC A Series (RS-232C only), Q Series, L Series, FX Series (RS-232C only) OMRON: SYSMAC C Series (RS-232C only), CJ/CS1/CP1 Series YASKAWA Electric Corporation: MP900 Series (RS-232C only)/MP2000 Series		
	Ethernet		• Can output numerical values and perform control input/output • Can output measured value and image data via the included PC programme • Supports FTP client and FTP server • VNC server (for non-PC clients, only displaying the monitor screen is supported) • 1000BASE-T/100BASE-TX/10BASE-T		
	EtherNet/IP		• Numerical value and control input/output using the Ethernet port enabled (Cannot be used in conjunction with PLC-link / PROFINET). • Cyclic (implicit) communication (max. 1436 bytes) possible. Message communication possible. • Maximum connections: 32. • In conformity with conformance test Version.A9.		
	PROFINET		• Numerical value and control input/output using the Ethernet port enabled (Cannot be used in conjunction with PLC-link / EtherNet/IP). • Cyclic communication (max. 1408 bytes) possible. Record data communication possible. • In conformity with Conformance Class A.		
	Mouse		Possible to control various menus via an optional dedicated mouse (OP-87506: included with the controller)		
Illumination control			By connecting the optional Illumination Expansion Unit CA-DC21E or CA-DC10E, lighting and intensity control *4 for the LED illumination is possible CA-DC21E: 2 ch/unit, up to 4 units can be connected, supports 12 V/24 V outputs CA-DC10E: 2 ch/unit, up to 1 unit can be connected, supports only 12 V output, impossible mixed connection with the CA-DC21E		
Language			Switched among English, Japanese, Simplified Chinese, Traditional Chinese, Korean, Thai, German, French, Italian, and Spanish (Mexican)		
Rating	Voltage		24 VDC ±10%		
	Consumption current		2.8 A (2 cameras)/ 3.1 A (4 cameras) Includes 1 A rush current during start up When a repeater is connected, this is increased by 0.3 A for every 2 cameras	2.5 A (2 cameras)/ 2.8 A (4 cameras) Includes 1 A rush current during start up When a repeater is connected, this is increased by 0.3 A for every 2 cameras	1.9 A (2 cameras) Includes 1 A rush current during start up When a repeater is connected, this is increased by 0.3 A for every 2 cameras
Environmental resistance	Operating ambient temperature		• When 2 cameras are connected: 0 to +50°C (when a 1 megapixel or higher camera is connected: 0 to 45°C) • When 4 cameras are connected: 0 to +45°C		0 to +50°C
	Operating ambient humidity		35 to 85% RH (No condensation)		
Weight			Approx. 1250 g		

*1 The letters that follow the model numbers, such as F/A/M/E, describe differences in the software. For details, see the user manual for the CV-X100 Series.
*2 A type with P-suffix at the end of its main unit model is a PNP open-collector.
*3 Models that are equipped with an Ethernet port on the CPU unit support direct connection with the Ethernet port.
*4 The CA-DC21E supports PWM/DC method switching, but the CA-DC10E is fixed to the PWM method.

Specifications (Camera Unit)

Camera (CV-H500C/CV-H500M/CV-H200C/CV-H200M)

Model		Camera unit (**CV-H500C/CV-H500M**) *4	Camera unit (**CV-H200C/CV-H200M**) *4
Image element		2/3-inch colour CCD image receiving element, 11x high-speed reading using square-pixel, 5.05 megapixel (CV-H500C) 2/3-inch monochrome CCD image receiving element, 11x high-speed reading using square-pixel, 5.05 megapixel (CV-H500M) Unit cell size: 3.45 µm x 3.45 µm	1/1.8-inch colour CCD image receiving element, 7x high-speed reading using square-pixel, 2.01 megapixel (CV-H200C) 1/1.8-inch monochrome CCD image receiving element, 7x high-speed reading using square-pixel, 2.01 megapixel (CV-H200M) Unit cell size: 4.4 µm x 4.4 µm
Number of effective pixels		4.99 megapixel 2432 (H) x 2050 (V)	1.92 megapixel 1600 (H) x 1200 (V) *5
Scanning system		Progressive (61.2 ms) Interlace: CV-H500M only (40.3 ms)	Progressive (29.2 ms: 2 megapixel mode, 24.2 ms: 1 megapixel mode) Interlace: CV-H200M only (16.1 ms: 2 megapixel mode, 13.6 ms: 1 megapixel mode)
Pixel transfer frequency		130 MHz (65 MHz x 2ch)	82 MHz (41 MHz x 2ch)
Transfer system		Digital serial transfer	
Electronic shutter		Can be set to 0.05 to 9000 msec by specifying the following numerical inputs: 1/15, 1/30, 1/60, 1/120, 1/240, 1/500, 1/1000, 1/2000, 1/5000, 1/10000, 1/20000	
Lens Mounts		C Mount	
Environmental resistance	**Operating ambient temperature**	0 to +40°C	
	Operating ambient humidity	35 to 85% RH (No condensation)	
Weight		Approx. 130 g (not including lens)	

*4 Only the high-speed camera cable can be used for the camera cable.
*5 When in 1 megapixel mode, the processing area is 980,000 pixels (1024 x 960).

Camera (CV-H100C/CV-H100M/CV-H035C/CV-H035M)

Model		Camera unit (**CV-H100C/CV-H100M**) *6	Camera unit (**CV-H035C/CV-H035M**) *6
Image element		2/3-inch colour CCD image receiving element, 7x high-speed reading using square-pixel, 1.04 megapixel (CV-H100C) 2/3-inch monochrome CCD image receiving element, 7x high-speed reading using square-pixel, 1.04 megapixel (CV-H100M) Unit cell size: 7.4 µm x 7.4 µm	1/3-inch colour CCD image receiving element, 7x high-speed reading using square-pixel, 340,000 pixels (CV-H035C) 1/3-inch monochrome CCD image receiving element, 7x high-speed reading using square-pixel, 340,000 pixels (CV-H035M) Unit cell size: 7.4 µm x 7.4 µm
Number of effective pixels		1 megapixel 1000 (H) x 1000 (V)	310,000 pixels 640 (H) x 480 (V) *7
Scanning system		Progressive (20.5 ms) Interlace: CV-H100M only (13.9 ms)	Progressive (4.7 ms) Interlace: CV-H035M only (2.5 ms)
Pixel transfer frequency		80 MHz (40 MHz x 2ch)	
Transfer system		Digital serial transfer	
Electronic shutter		Can be set to 0.05 to 9000 msec by specifying the following numerical inputs: 1/15, 1/30, 1/60, 1/120, 1/240, 1/500, 1/1000, 1/2000, 1/5000, 1/10000, 1/20000	
Lens Mounts		C Mount	
Environmental resistance	**Operating ambient temperature**	0 to +40°C	
	Operating ambient humidity	35 to 85% RH (No condensation)	
Weight		Approx. 120g (not including lens)	

*6 Only the high-speed camera cable can be used for the camera cable.
*7 When in 310,000 pixel mode, the processing area is 310,000 pixels (640 x 480). When in 240,000 pixel mode, the processing area is 240,000 pixels (512 x 480).

Camera (CV-200C/CV-200M/CV-S200C/CV-S200M)

Model		Camera unit (**CV-200C/CV-200M**) *8	Camera unit (**CV-S200C/CV-S200M**) *8
Image element		1/1.8-inch colour CCD image receiving element, reading using square-pixel, 2.01 megapixel (CV-200C) 1/1.8-inch monochrome CCD image receiving element, reading using square-pixel, 2.01 megapixel (CV-200M) Unit cell size: 4.4 µm x 4.4 µm	1/1.8-inch colour CCD image receiving element, reading using square-pixel, 2.01 megapixel (CV-S200C) 1/1.8-inch monochrome CCD image receiving element, reading using square-pixel, 2.01 megapixel (CV-S200M) Unit cell size: 4.4 µm x 4.4 µm
Number of effective pixels		1.92 megapixel 1600 (H) x 1200 (V) *9	
Scanning system		Progressive (58.5 ms: 2 megapixel mode, 47.6 ms: 1 megapixel mode) Interlace: CV-200M only (32.7 ms: 2 megapixel mode, 27.0 ms: 1 megapixel mode)	Progressive (58.5 ms: 2 megapixel mode, 47.6 ms: 1 megapixel mode) Interlace: CV-S200M only (32.7 ms: 2 megapixel mode, 27.0 ms: 1 megapixel mode)
Pixel transfer frequency		40 MHz	
Transfer system		Digital serial transfer	
Electronic shutter		Can be set to 0.05 to 9000 msec by specifying the following numerical inputs: 1/15, 1/30, 1/60, 1/120, 1/240, 1/500, 1/1000, 1/2000, 1/5000, 1/10000, 1/20000	
Lens Mounts		C Mount	Special mount (M15.5 P0.5 male)
Environmental resistance	**Operating ambient temperature**	0 to +40°C	Head: 0 to +40, relay unit: 0 to +40°C [however, 35°C max. with partial capturing 50 lines or lower]
	Operating ambient humidity	35 to 85% RH (No condensation)	
Weight		Approx. 110 g (not including lens)	Head: Approx. 210 g (including cable and lens), relay unit: approx. 70 g

*8 Camera cables CA-CN17/L/R (17 m) and the repeater cables CA-CN17LX/RX (17 m) cannot be used.
*9 When in 1 megapixel mode, the processing area is 980,000 pixels (1024 x 960).

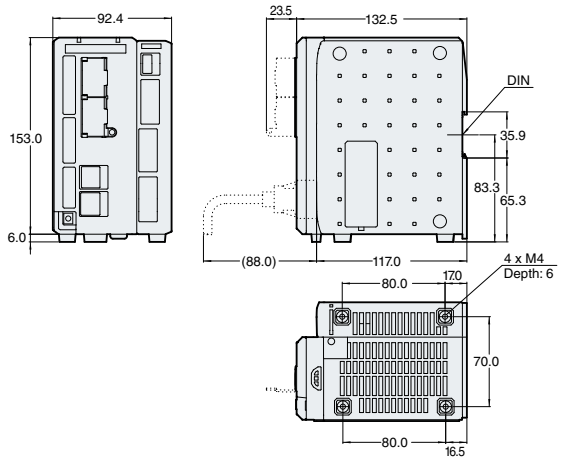
Camera (CV-035C/CV-035M/CV-S035C/CV-S035M)

Model		Camera unit (**CV-035C/CV-035M**)	Camera unit (**CV-S035C/CV-S035M**) *10
Image element		1/3-inch colour CCD image receiving element, 2x high-speed reading using square-pixel, 350,000 pixels (CV-035C) 1/3-inch monochrome CCD image receiving element, 2x high-speed reading using square-pixel, 350,000 pixels (CV-035M) Unit cell size: 7.4 µm x 7.4 µm	1/3-inch colour CCD image receiving element, 2x high-speed reading using square-pixel, 350,000 pixels (CV-S035C) 1/3-inch monochrome CCD image receiving element, 2x high-speed reading using square-pixel, 350,000 pixels (CV-S035M) Unit cell size: 7.4 µm x 7.4 µm
Number of effective pixels		320,000 pixels 656 (H) x 492 (V) *11	
Scanning system		Progressive (16.0 ms) Interlace: CV-035M only (8.8 ms)	Progressive (16.0 ms) Interlace: CV-S035M only (8.8 ms)
Pixel transfer frequency		24.5 MHz	
Transfer system		Digital serial transfer	
Electronic shutter		Can be set to 0.05 to 9000 msec by specifying the following numerical inputs: 1/15, 1/30, 1/60, 1/120, 1/240, 1/500, 1/1000, 1/2000, 1/5000, 1/10000, 1/20000	
Lens Mounts		C Mount	Special mount (M 10.5, P 0.5, male)
Environmental resistance	**Operating ambient temperature**	0 to +50°C	Head: 0 to 50°C, relay unit: 0 to 40°C
	Operating ambient humidity	35 to 85% RH (No condensation)	
Weight		Approx. 100 g (not including lens)	Head: Approx. 160 g (including cable and lens) Relay unit: Approx. 70 g

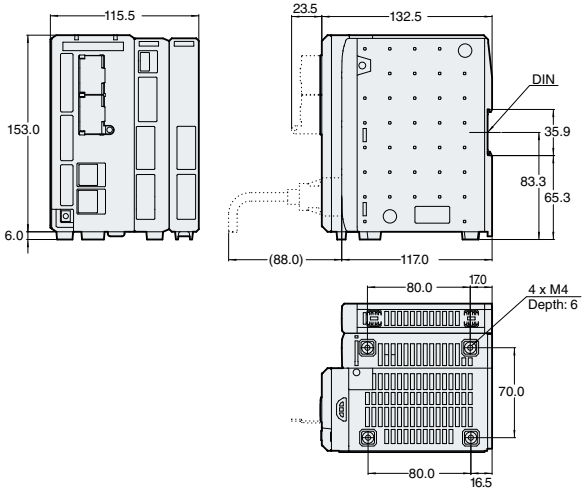
*10 Camera cables CA-CN17/L/R (17 m) and the repeater cables CA-CN17LX/RX (17 m) cannot be used.
*11 When in 310,000 pixel mode, the processing area is 310,000 pixels (640 x 480). When in 240,000 pixel mode, the processing area is 240,000 pixels (512 x 480).

Unit: mm

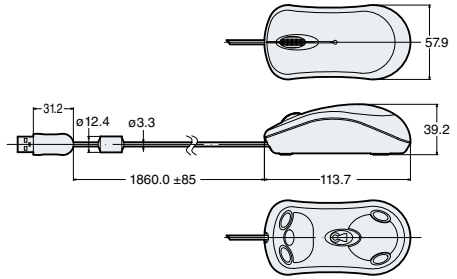
Controller CV-X170x/CV-X150x/CV-X100x



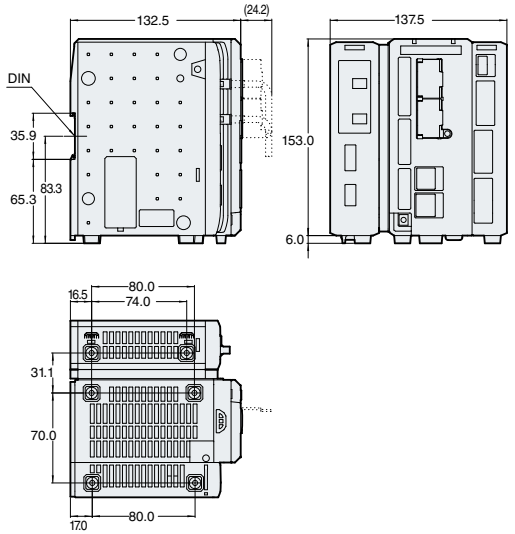
With the camera expansion unit equipped (CV-X170x/CV-X150x only)



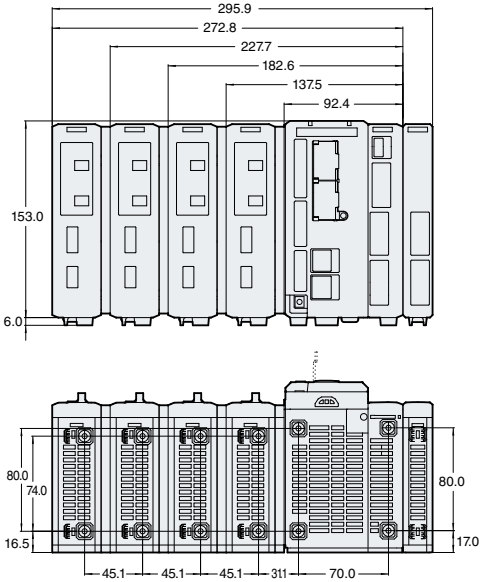
Mouse OP-87506



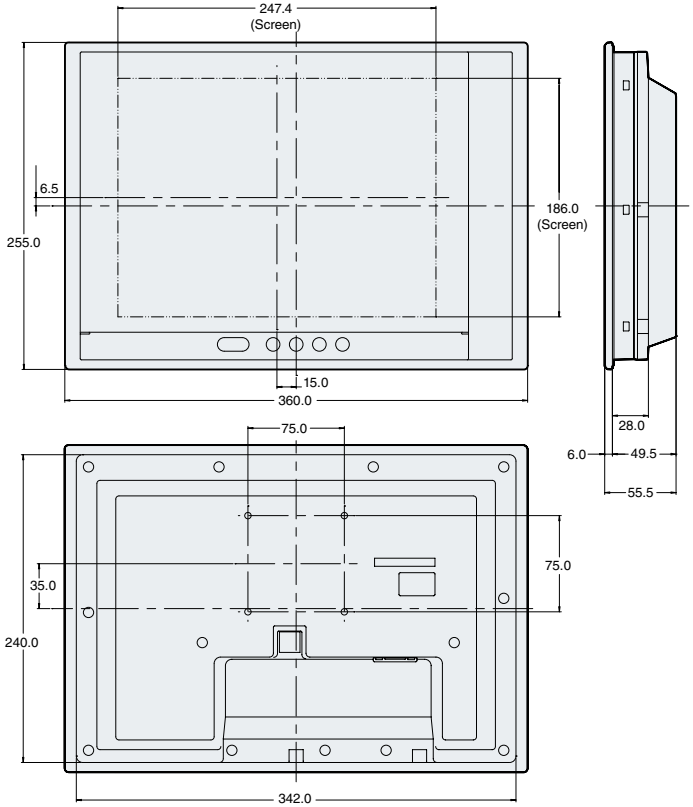
When mounting the illumination expansion unit CV-X100x+CA-DC21E



CV-X170x+CV-E500+CA-DC21E (4 units)

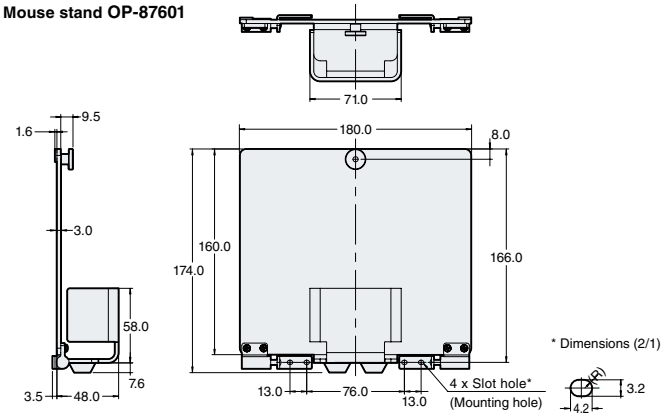


XGA monitor CA-MP120

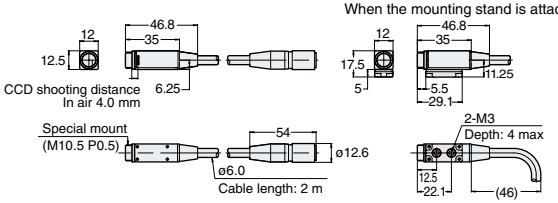


Unit: mm

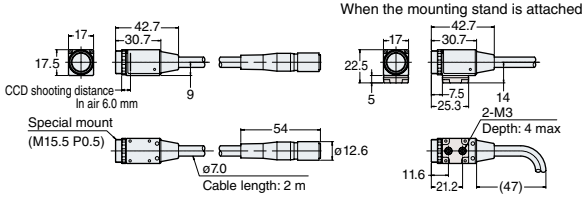
Mouse stand OP-87601



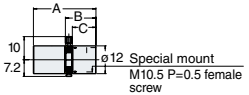
Camera CV-S035CH/CV-S035MH



Camera CV-S200CH/CV-S200MH

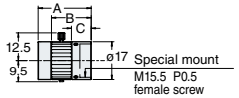


Lens CA-LSx



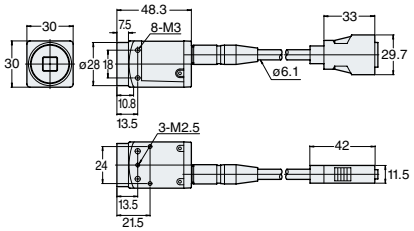
	CA-LS4	CA-LS6	CA-LS16	CA-LS30
A	16.7	21.3	20.4	27
B	11.5	15.9	10.2	13.2
C	8.5	12.9	7.2	10.2

Lens CA-LHSx

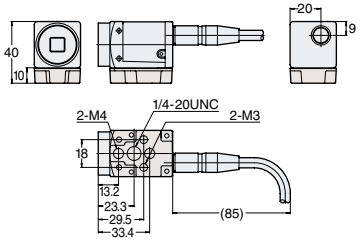


	CA-LHS8	CA-LHS16	CA-LHS25	CA-LHS50
A	40.4	23.9	24.9	40.4
B	28.6	17.9	18.6	27.1
C	19.6	8.9	9.6	18.1

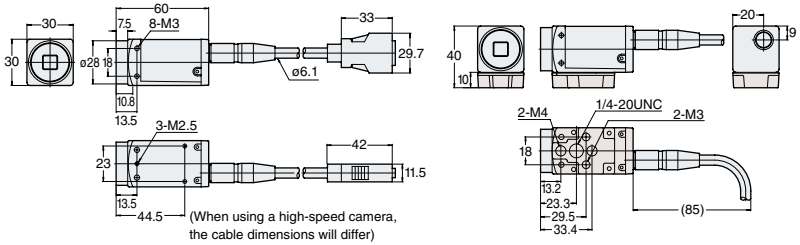
Camera CV-035C/CV-035M



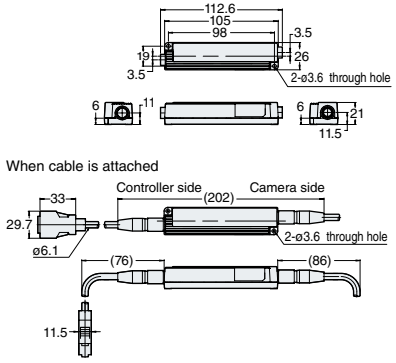
When the mounting stand is attached



Camera CV-H500C/CV-H500M/CV-H200C/CV-H200M/CV-200C/CV-200M/ CV-H100C/CV-H100M/CV-H035C/CV-H035M



Camera control unit CV-S200CU/CV-S200MU/CV-S035CU/CV-S035MU



Camera cable

CA-CN1 (1 m)/**CA-CN3**(3 m)/**CA-CN5** (5 m)/**CA-CN10** (10 m)/ **CA-CN17** (17 m)

High-flex camera cable

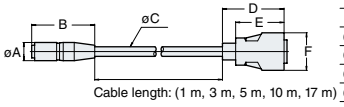
CA-CN3R (3 m)/**CA-CN5R** (5 m)/**CA-CN10R** (10 m)/ **CA-CN17R** (17 m)

High-speed camera cable

CA-CH3 (3 m)/**CA-CH5** (5 m)/**CA-CH10** (10 m)

High-flex cable for high-speed cameras

CA-CH3R (3 m)/**CA-CH5R** (5 m)/**CA-CH10R** (10 m)



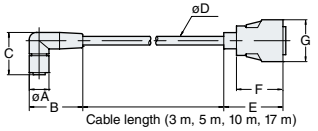
	A	B	C	D	E	F
CA-CNx	12.5	43	6.1	42	33	29.7
CA-CNxR	14.0	54	6.6	42	33	29.7
CA-CHx	12.5	43	7.2	41	31	31.4
CA-CHxR	14.0	54	7.6	41	31	31.4

L-shaped connector camera cable

CA-CN3L (3 m)/**CA-CN5L** (5 m)/**CA-CN10L** (10 m)/ **CA-CN17L** (17 m)

L-shaped connector cable for high-speed cameras

CA-CH3L (3 m)/**CA-CH5L** (5 m)/**CA-CH10L** (10 m)



	A	B	C	D	E	F	G
L-shaped connector camera cable **CA-CNxL**	14	38	30	6.1	42	33	29.7
L-shaped connector cable for high-speed cameras **CA-CHxL**	14	38	30	7.2	41	31	31.4

Please refer to the “Vision System Peripheral Equipment catalogue” in regards to any dimensional diagrams for additional devices that have not been included here.

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SAFETY INFORMATION
Please read the instruction manual carefully in order to safely operate any KEYENCE product.

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WW2-1013

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CVX2.1-WW-C-GB 1043-1 600B78 Printed in Japan